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PROCEEDINGS. CONFERENCE IN THE MATTER OF POLLUTION OF THE NAVIGABLE WATERS OF BISCAYNE BAY AND ITS TRIBUTARIES IN THE STATE OF FLORIDA HELD AT MIAMI FLORIDA, ON FEBRUARY 24, 25, 26, 1970

Federal Water Pollution Control Administration
Washington, D.C.

26 February 1970

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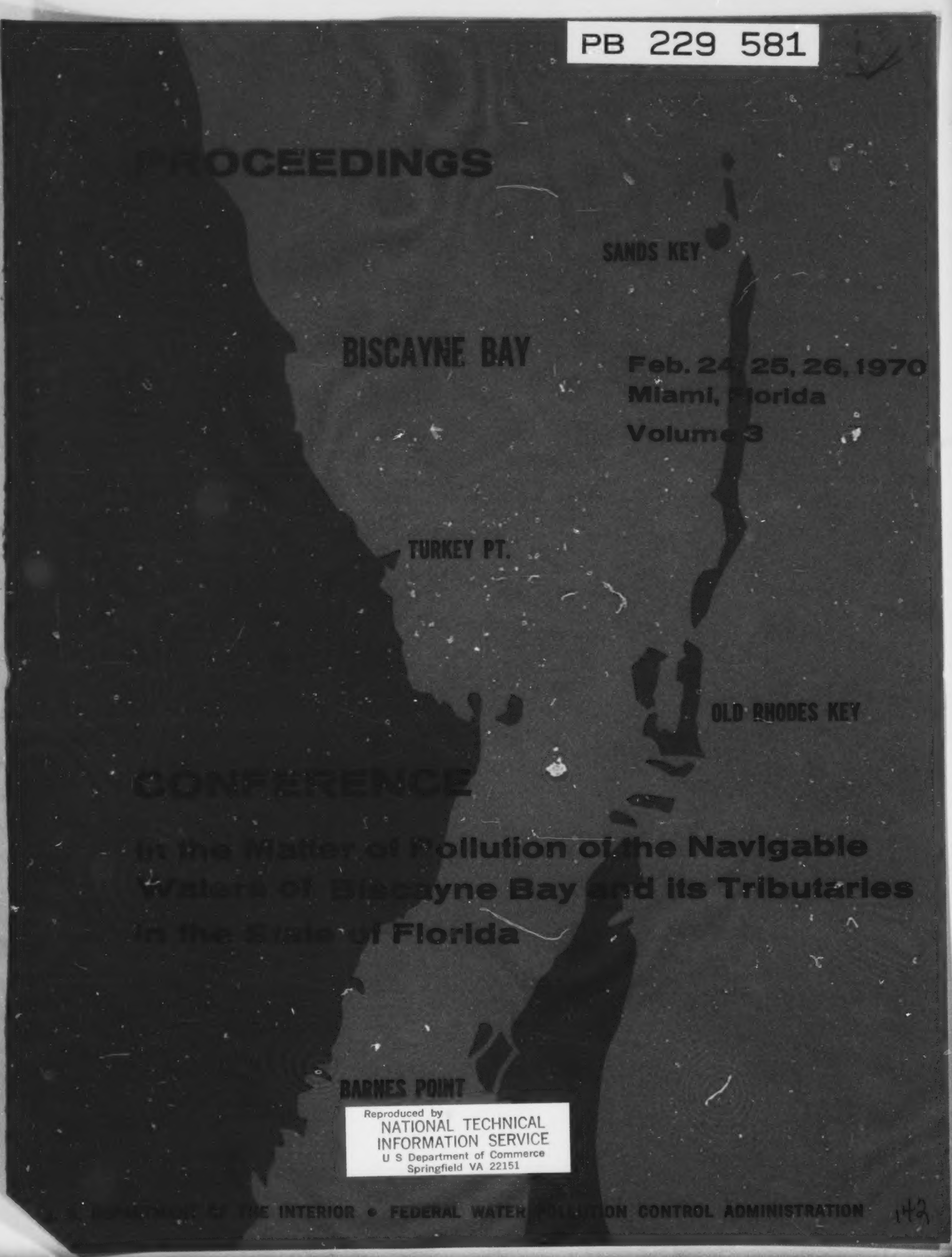
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Feb. 24, 25, 26, 1970
Miami, Florida
Volume 3

CONFERENCE

In the Matter of Pollution of the Navigable Waters of Biscayne Bay and its Tributaries in the State of Florida

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DEPARTMENT OF THE INTERIOR

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION

CONFERENCE

IN THE MATTER OF POLLUTION OF THE NAVIGABLE WATERS OF BISCAYNE BAY AND ITS TRIBUTARIES IN THE STATE OF FLORIDA

The Four Ambassadors Hotel
801 South Bayshore Drive
Miami, Florida
Thursday, February 26, 1970

Convened, pursuant to notice, at 9:30 a.m.

PRESIDING:

Murray Stein	Assistant Commissioner for Enforcement, Federal Water Pollution Control Administration, U. S. Department of the Interior, Washington, D. C.

CONFEREES:

John Thoman	Director, Southeast Region, Federal Water Pollution Control Administration, U. S. Department of the Interior Atlanta, Georgia
Nathaniel Reed	Chairman, Florida Department of Air and Water Pollution Control, Tallahassee, Florida
Vincent Patton	Executive Director, Florida Department of Air and Water Pollution Control, Tallahassee, Florida

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PROCEEDINGS

MR. STEIN: May we convene.

MR. REED: Mrs. Perry, from the Bel Aire Women's Club.

MRS. I. E. PERRY,
BEL AIRE WOMEN'S CLUB,
MIAMI, FLORIDA

MRS. PERRY: Mr. Chairman, distinguished members of the Board, I represent the Bel Aire Women's Club in South Dade. Ours is not expert testimony, as you have been listening to for the past 2 days. As a matter of fact, we are rather reluctant to take up your time, especially since everyone is anxiously awaiting a decision.

However, since we have heard so much about public apathy in regards to pollution, we feel that as citizens it is our duty to make ourselves heard, and to express our views on the issue.

Our knowledge of pollution, and especially thermal pollution, is limited. Nevertheless, after 1 year of attending hearings before the various county boards in regard to Florida Power & Light vs. Biscayne Bay, we believe that Florida Power & Light must be asked to find methods other than those proposed to properly cool the effluent to a degree where it no longer will have any damaging effects on Biscayne Bay, or at a later date Card Sound.

We feel, gentlemen, that nature has given us a warning. It can no longer tolerate the abuse that is has been subjected to over the years, not only by industry but by all of us.

To employ different methods, the company claims it is not feasible, mainly because of the cost involved. So far we have not been told just how much of an increase the individual consumer would recognize. It might be only a slight increase and would certainly be worth it when we consider the future preservation of our natural environment. And, really, it is only the cost which prevents the company from safely cooling the effluent.

We would like to refer to the Florida State pollution law, which states that industry must make initial investments to comply with the pollution control law. Sooner or later, we will face an increase in the cost of electricity, and speaking for many, we are prepared to pay for this.

The decision that you reach, gentlemen, will not only decide the fate of Biscayne Bay but also the entire Nation. We have heard earlier in this hearing that it took Biscayne Bay 3,500 years to develop. Do we consider ourselves so almighty that we only push a button, so to speak, to destroy all of this? We realize and accept the fact that we must have progress and that we must plan for the future now. But progress without the proper precautions for our natural environment is not only showing disregard for the environment but self-destruction.

Surely, with all the scientific and technical knowhow represented at this hearing alone for the past 2 days, a solution could be arrived at.

Gentlemen, we place the Florida Power & Light problem, Biscayne Bay, and all of South Florida into your very capable hands.

Thank you.

MR. REED: Thank you, Mrs. Perry.

Are there any questions? Thank you so much, and again I thank you for your patience in waiting to testify. It was worth it for us, I know.

I think I ought to go through the cards again to see if there is anybody that I do have a card on who wishes to speak. If anybody else wishes to speak, please identify himself.

Mr. Murphy, Mr. Togue, Donald Thompson of Mapco, Dr. Stevenson, Dr. Calvert, Mr. Sales, Mr. DeLavega, Mr. Haller, Mr. Coggins, George Cooper, Jr., Miss Moore, Mr. White, Mrs. Oakerson.

Do you wish to testify?

MR. CHAPMAN: Please.

MR. REED: Come forward and identify yourself. If you have a card, I would appreciate receiving it.

B. J. CHAPMAN,
PROFESSIONAL ENGINEER,
DADE COUNTY POLLUTION CONTROL HEARING BOARD,
CORAL GABLES, FLORIDA

MR. CHAPMAN: I gave the card to the secretary.

I am B. J. Chapman. I am a member of the Dade County Pollution Control Hearing Board. I have not attended the proceedings up to this time. However,

B. J. Chapman

I would like to reiterate for this panel the situations that have occurred with the Dade County Pollution Control Hearing Board.

At the present time, it is obvious that we have pollution occurring in Biscayne Bay at the Turkey Point plant as a result of the two fossil fuel plants. The situation as it now stands cannot be easily corrected. The cooling canal that has been proposed by Florida Power & Light will, in effect, cure the present pollution that is occurring at the Turkey Point plant, inasmuch as we have provided for at least 150 percent dilution of the effluent water from the fossil fuel plants.

Now this will mean, in effect, since the pollution occurs during the summer months, that we will have an elimination of the situation during the coming summer and will have at least a 2 year recovery period of that part of the bay that has now been polluted.

This part of the bay, I feel, is essential to the existence of the Biscayne Bay National Monument.

Now, secondly, the discharge canal will not be used for the nuclear plant until approximately April

1971. From April 1971 until June 1, 1971, there is a shakedown of the first nuclear plant. We have provided in the hearings before the control board in Dade County that complete and sufficient tests shall be made at the time of the shakedown of that plant to correlate what the results will be on the lower section of Biscayne Bay.

Now, it is presumed at this time that some effects can be anticipated, either good or bad, which cannot be determined exactly at this time. Expert testimony of all of the people that have appeared before our board is that, in effect, they have been good and very considerate of their propositions, but as yet we have no factual information of what the results may be.

If at the time of June 1, 1971, when the first nuclear plant goes into operation, the evaluation study that will have to be made by both the Dade County Pollution Control officer and Florida Power & Light will correlate all aspects of the future, and the future effects on Biscayne Bay. At that time, Florida Power & Light, since we have specifically withheld any permission to pollute Biscayne Bay from them, it will be encumbent upon them then to provide whatever new solution is required to eliminate the pollution.

B. J. Chapman

Therefore, in the opinion of the Dade County Pollution Control Hearing Board, we feel that the canal -- the discharge canal that has been proposed -- is the only practical and logical solution to the approach, the long range approach of saving Biscayne Bay.

It is understood that the heat generated by these plants will, in effect, place Biscayne Bay in the position of being a heat sump. This heat sump must discharge its temperatures to the atmosphere. There are other methods in which we can discharge temperature to the atmosphere. We have gone through processes of cooling towers, through processes of cooling ponds, through processes of ocean outfall, through many other plans that were considered feasible of the plans that were presented.

For instance, we shall take the ocean outfall. Not only would the cost be almost prohibitive for the ocean outfall, but the upset of the bay and its effect on the Biscayne National Monument and upon the John Pennekamp Park to the south would be almost devastating. We could not evaluate any means to accomplish recovery of this area should such a pipeline be constructed.

B. J. Chapman

For the proposition of cooling ponds, the cooling pond proposition appeared very likely to be an answer. However, it will cover a vast area. This vast area, although very shallow in depth, will have to be lined with some material that would protect it from leakage of the salt water into our underwater strata. Leakage of this system and because of its vast area, we feel, presents a definite and dangerous situation when viewing our water system -- our South Florida water system from the standpoint of polluting the Biscayne aquifer.

The third proposition which appeared feasible was cooling towers. We feel that the situation of cooling towers has become somewhat impractical because of the drift of salt water or salt into the adjoining areas.

We have in effect a large air base that is close by. We have innumerable acres of industrial or agricultural farm land that could well be affected.

Fourthly, the accumulation of salt would become so great that a disposal method would be required. It is presumed that with proper industry, possibly this salt could be converted to some beneficial usages. However, this would require other industrial complexes.

B. J. Chapman

Summing up the proposition, since we are dealing with heat and its effect upon the processes of Biscayne Bay, there are many processes available to other industries in the United States that could well utilize this amount of waste heat productively. To do such a thing requires considerable leadtime.

We on the Board are not in a position to, in effect, say that any particular person will do a particular thing. I am suggesting and recommending that the canal system be maintained as a means of curing the existing pollution and as a source of study to effect a cure to the overall system.

Within that length of time I am sure that our American ingenuity will find a way to prevent this pollution from occurring.

There are such simple things -- as I mentioned to the gentleman from Seadade, the attorney -- airconditioning and heating might be available to their vast holdings for free.

Now, this proposition is not one in which we can, shall we say, threaten or force particular action. This situation is one in which all of our facilities, both Federal, State and local must work together in some means or some manner to cure the problem. It is not one that we can, shall we say, legislate.

We are attempting, Florida Power & Light is attempting, the local board is attempting, the Pollution Control officer is attempting to find answers to the problems, and the answers to these problems I am certain are forthcoming.

I, therefore, beg of you to reconsider your rejection of the canal system as being inappropriate for this application.

I thank you.

MR. REED: Thank you, Mr. Chapman.

MR. STEIN: Are there any comments or questions? I would like to state for the record no one has accepted or rejected anything yet.

MR. HATCOCK: Mr. Stein, may I speak?

MR. REED: Have you filled out a card?

MR. HATCOCK: No, I haven't.

MR. REED: Come up and identify yourself.

TED HATCOCK, INVENTOR,
MIAMI, FLORIDA

Ted Hatcock

MR. HATCOCK: I am Ted Hatcock, and I have lived here in Miami since 1937, and I am a retired science teacher, and I am also an inventor. I have here some plans that I am sending to Washington for patent. This I think will help the Florida Power Company because, according to the plan and my figures which I have worked out here, we could utilize the canal that you have and reverse your thinking -- pump out those canals the cool water and go through your condensers, circulate it back through your property by the means of a basin. This basin at the end has a control, automatic control gate. You can hold that at two feet MSL, or if you prefer a little higher.

Then that would run into another canal from which ditches would lead off, but not intersect with the other long ditches going into your canal that you pump from. In other words, they are about 100 feet apart. This soil there is very porous. It is like a sponge. And this water, going from the hot water canal through these ditches, percolating through the long ditches that carry it into your canal will cool this water.

Not only that, but you could lower the water in that area in your property -1 foot MSL*, and this will enhance the value of your property anywhere between $500 and $1,000 an acre. Your property then will become valuable. Like it is down here now, it is a wasteland. By this system, by using this system which could be done with the present canals that you have, it could be done for less than $1 million.

Now, I have figures here. I would like to go over them with the Florida Power Company.

MR. STEIN: Mr. Hatcock, I would like to apologize to Florida Power & Light. We are not providing the captive audience, for whatever you have for Florida Power & Light Company, for a sales pitch. You are not even addressing this to the conferees, but you are talking to the company. We know we have the company officials here. We had hoped you would give us advice the conferees could use.

We do not want to be a party to the officials' time to listen to a pitch for them to employ one system or another. I don't think this is very fair.

MR. HATCOCK: I thought this was for the solution for all of the headaches you have here.

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* mean sea level

MR. REED: Right. I think the thing for you to do is present the plan to the company so that they can fully evaluate it. I think that would be a good solution to the problem.

MR. HATCOCK: All right, I'd be glad to. I just thought this would be a good solution.

MR. REED: I am very appreciative of your coming forward and telling us about your idea.

MR. HATCOCK: Thank you.

MR. REED: Is there anybody else who wishes to speak?

DR. ROBERT A. STEVENSON,
ASSISTANT PROFESSOR,
INSTITUTE OF MARINE SCIENCES,
UNIVERSITY OF MIAMI, MIAMI, FLORIDA

DR. STEVENSON: You have my name. I am Dr. Stevenson.

MR. REED: If I don't, you are welcome to speak if you wish.

DR. STEVENSON: My name is Dr. Robert A Stevenson, and I am a member of the staff at the Institute of Marine Sciences at the University of Miami.

Dr. Robert A. Stevenson

I am here not as an official representative or spokesman for our Institute but on my own volition. I am extremely interested in ecology and the future problems of mankind because I am a biologist.

I have been a marine biologist for some 15 years now. I am an environmental biologist, largely. That is, I have spent most of my time in the environment in situs. I have been a scuba diver since 1953, and I have made experiments underwater right in the tropical marine environments.

In the Pacific Ocean I spent 5 years. I spent time in the Hawaiian Islands. I also worked off the western coast of Central America, Mexico. I worked in the Marshall Islands, and all of this for a period of 5 years.

For over 2 years I worked in the Caribbean Sea. At the University of Puerto Rico I was a Member, Associate Scientist at the Puerto Rico Nuclear Center, Atomic Energy Commission. In that area I conducted studies in the tropical marine environment studying the trace element distribution of marine animals and plants in that area. I worked at the nuclear powerplant which is at Punta Gorda on the western tip of Puerto Rico. This was a relatively small nuclear powerplant in relation to the one that you gentlemen are going to put up down here at Turkey Point.

I was beginning to conduct a survey there of the effects of heated effluent from that plant, which only discharged something in the nature of -- I think it was 70,000 gallons per minute, and I think they had something like a 10° ambient.

I am not going to talk about that. I just want to tell you that I have had exposure to these things which, of course, has influenced my thinking.

I have been here at the Institute for about 4½ years now. I have continued my environmental studies -- underwater television, which has allowed us to spend a great deal of time underwater, so to speak, without actually going underwater.

I studied fish behavior mainly and I have studied this in relation to those natural phenomena which greatly affect fish behavior and ecology. The two dominant relationships I studied were the effects of underwater illumination and currents and also turbidity to see how it affected the feeding behavior, etc. of these fishes.

Dr. Robert A. Stevenson

I have been concerned with this. I have not been concerned at all with the Turkey Point project or the studies down there, not formally. I kept some eye on them, but I am basically a marine biologist. I studied a wide range of organisms from fishes to crustaceans, molluscs, etc. I know it sounds like a lot to swallow. I am an animal behaviorist. I have studied very extensively in this field. This, I guess, is my carrying through influence. This I have always enjoyed doing.

I have also been in oceanography, and I have been a planktologist and worked with plankton for 3 years at the Bureau of Fisheries, the Bureau of Commercial Fisheries in Honolulu, and did research catching plankton, sorting them and identifying them and working up the data, etc.

Well, I followed these sessions as best I could over the last 2 days. I have missed a number of them. I undoubtedly missed a certain amount of important information. It is apparent to me that there is a rather great disparity in the data on the killing of marine life as presented here.

Dr. Robert A. Stevenson

Two groups of biologists have presented data which is opposing, and I will say more about that later. But right now I want to examine where this leaves us. I am very concerned about this. It would help us to have even more data than we have -- a great deal more data than we have. But at the moment, we don't have the data, so we have to operate within whatever framework we have.

It would be helpful and highly desirable if we could run the proper kinds of tests we need to be able to accurately predict what will happen. This I will say is impossible for many, many reasons that are far too extensive to go into today.

Essentially, though, what it revolves around is the extreme complexity of an ecological system of animals and how they interact and the fallacy that you can find one or two organisms, for instance, as indicators to what will happen to a complex ecological system. This is a mistake. I don't think it can be done. I think it is impossible.

So where does this leave us? To me, it means that we have to examine basic biological and physical principles that are known to affect many living organisms, and that will be the theme of my discussion today.

This is why I am here, to examine some basic biological and physical principles and to show, as best I can, based on my knowledge and experience, how they work, particularly the planktonic part of a marine ecosystem. I think it is very important to look into the mechanics of life and ecology so we can better predict what can happen.

Of course there is variability. We know that a bee can sting one gentleman here and he will fall over dead, and if he stings just somebody else they will only feel the bump. Sure, we are all different.

If I open a can of cyanide and we didn't get out fast enough, I'm sure we would all go the route. This is fact, too.

Now, most marine animals have larval stages. I don't think these have been adequately described, just what are larvae. Larvae are extremely small animals. Some of them you can put in a little dish, and if you look carefully you can see these tiny baby fishes, baby clams, baby crabs swimming around. These are plankton.

Dr. Robert A. Stevenson

I want to dwell for just a moment on their size because this is extremely important. It is of fundamental importance to live. These plankton, by virtue of their small size, have many difficulties just living. Some of these difficulties are biological. Some of them are physical and they both interact.

Because of their extreme size, they have what we call a very high surface-to-volume ratio. What this means is that if you were to take the mass -- the amount of muscle and everything inside this very tiny larva -- and measure a portion against the amount of outer covering, the skin of the fish, the total area outside, its head and tail and everything, you would find there is a very high ratio. And you would find something else in an organism of this size -- an engineer would tell you that the viscosity medium is greater to this animal. This animal has a harder time getting through the medium because of the small size. There is more drag. It takes, therefore, more muscle power for a very, very small organism to move, especially through a dense medium like water.

So right away this small organism, and not just one, this is dominant; all small organisms face this. This organism is at a disadvantage in the medium. This means it cannot go very far physically because it must have a certain amount of energy. That energy is contained in its muscle. This animal must push itself through the water. Its load, for instance, is greater than it is for a larger animal. A larger animal has a different ratio. It can swim much farther in search of food, I will submit. So this is a mechanical and a biological problem that is inherent, and it is dominant throughout all animals. At least I will restrict that to the aquatic environment for the moment.

It means something else, this very small size. If I were to suddenly drop the temperature 10° in this room, everyone would feel it. Perhaps, you would all start to shiver, but if we stay here for several hours we would still be alive.

This is because of two reasons: We have compensating mechanisms in our body. We have a vascular system, blood system and vessels and things, which vessels contract or expand to allow more heat to keep our body temperature the same. But we have a relatively small skin area in relation to our body, so, although we are cold all over, it takes that temperature longer to leave our body because we have a lot of body mass. It takes a long time for this temperature to leave.

Not so with an extremely small organism. An organism of planktonic size, when you reach a sudden temperature change like this, essentially animal is immediately now at the new temperature of its surroundings. This means that any mechanisms that are built into such a tiny animal to withstand such a thing as a rapid temperature change do not have time to work. The animal gets it immediately, just like that. It could be temperature; it could be chemical activity.

Now, I'll mention to you a group of organisms known as flat worms. A great deal of them, the ones that we know, have digestive systems. They have mouths. They have esophaguses through which food passes to the stomach -- a system of digestion.

The small worms of planktonic size don't have digestive systems. They don't have mouths. The reason is their surface area in relation to their volume is so great that they take up the things that they need from the environment right through the skin. They can do this.

Dr. Robert A. Stevenson

So a plankton, you see, also has this disadvantage: If it is thrown into a chemical medium, for instance, even a natural chemical medium of quickly reacting chemical environment; if this is an adverse chemistry to which it is exposed -- it immediately reacts giving no time for compensating mechanisms to allow the animal's survival, unless time is given to the animal.

I want to stress those basic points which have been borne out many times, and which are accepted as scientific truths. That is a relative static situation. We are learning that animal behavior is extremely important. For an animal to eat it must move, like a hand to a mouth -- that is animal behavior. You will be surprised how complicated that act can be. Some people spend years just analyzing these thaings -- the reflexes and all sorts of things.

Animals cannot eat everything. They have specialized feeding requirements. Some can eat only a few different kinds of food. You can expose them to all the conditions, but if you don't give them exactly the right food that they need and can react to they will die.

They are not like people. They can be told, "That's also good, John. You can eat it." John says, "I'm mighty lucky I can eat that."

An animal has to see things, and it has to be built in for the animal to react to that. So there are things that cause an animal to approach and eat its prey. Some of these are of a size -- I have to see something of a proper size. It may have a particular shape, a particular color; it may have to move, it can't drift along without any motion. These are only a few things. It gets much more highly complicated.

Many animals have built into their structure, into the structure of their eyes filtering mechanisms that allow them to see perhaps blues or greens better because that is the color of the prey. They can do nothing about this. They have to react in a certain way. They are not pliable like many larger animals.

Larval fishes, to mention a group, are quite specific in the kinds of food that they will eat. This is one of the problems of keeping normal larval food. It is most important to put the right kind of food in there, and it takes years of sorting to find out what they will react to.

They put it in their mouth and spit it out.

Dr. Robert A. Stevenson

All of this is an extremely important part of the bare problem in environmental relationship. The signifance of this is that in all the many kinds of plankton only certain organisms serve as food for others. Think about that. Now, all of the plankton don't look like so much. There is a lot of plankton, but it doesn't look like so much because only a part of it is available to part of the organism. This is not the only problem that the larva has, being behaviorly programmed to eat only certain foods. Animals have to hunt for food.

I could illustrate this with a lion. There are very few lions. There are a great many more antelopes, wildebeests and all the various animals that inhabit the African plains. There must be a great number of organisms for a lion to survive because a lion is not efficient enough to catch any organisms that it wants to catch. It can't go after any specific zebra and catch it and eat it. It has to have what we call a large biomass, a large pyramid of numbers. There has to be a tremendous supporting backlog of biological energy in the form of animals to support it.

What the lion does is to pick out those

animals that are unwary. Take 10,000 antelope. Some are less wary and some more wary than others, and some are average wary. Some are a little weaker than others. Some aren't born quite as strong. Some din't get quite enough to eat over the last 5 days.

These are what a lion feeds on and is able to get. The lion is able to get these because there are so many animals that statistically some of them will fall prey to the lion, for the reasons that I have outlined.

I would also go further with this to break this down from an adult lion to an immature juvenile lion. The immature juvenile lion is inexperienced, so lesser a biomass, and thus those animals are available to it. It doesn't have the stamina of an adult lion. It can't range as far afield as an adult lion to get its prey. It will run out of energy sooner. So that is this problem.

Now, let's take this a little bit further and say that under normal conditions, say, a day when the temperature is in the 70's on the plains, something like this, we have one situation. The adult and Juvenile lions react in certain ways, and I try to show they both do not have the same capabilities.

Dr. Robert A. Stevenson

At 70° they would have one capability. These are hypothetical figures for demonstration purposes. Let's take a real hot day when the temperature goes way up. Now, this imposes a far more difficult logistical problem because the animal now has to expend additional energy to overcome the heat. That is a heat transfer problem.

So now, you see, the situation is different at a higher temperature than it is at a lower temperature.

Now, plankton are organized in the same way. All nature is. This is a fundamental law of nature -- that there must be many, many organisms to support a larger predatory organism. It is not a 1 to 1 ratio. It cannot be for the reasons that I have outlined.

Now, small weak larvae for the reasons described must have a lot of food close by. I mentioned that by their size they have energy problems, critical energy problems. So they quickly run out of energy if they don't have sufficient numbers close to them. If you watch the behavior of these things, they spurt. They move a little bit and they stop and drift for awhile; and they move and stop and drift for awhile.

Dr. Robert A. Stevenson

So you can imagine what would happen if you have reduced the concentration of potential prey for these small organisms -- they quickly run out of energy in the order of days. We watch them in the aquarium all the time. We have people at the marine lab who work on this and who are making breakthroughs, but must keep it at a high concentration of organisms. Some others are given a little bonus because they have an egg sac that slowly absorbs and keeps them going for a week or something. But the minute that yolk sac is gone that animal has 24 hours, depending on the species, in which to find food and eat it. If there isn't sufficient food in its immediate vicinity it simply cannot by energy requirements go farther. It has to get its food.

This is the fundamental thing that I want to try to bring into the operation that is proposed in Biscayne Bay.

I want to make one comment. This shows you why literally 2 or 3 organisms out of billions of eggs and sperm castoffs generally survive to adulthood in the marine world.

Dr. Robert A. Stevenson

Now, turning to the existing situation at Turkey Point -- and I say "existing situation" -- we have one group of biologists with which I am familiar, colleagues of mine: Dr. Voss and his workers, co-workers, who have presented data, and you can correct me on this if I am wrong, panel, who have found kills, planktonic kills at the hot side of the existing condenser of, I believe it is, between 90 and 100 percent. This is almost total kill.

The group of biologists that are working for Florida Power & Light have not found this. I know our own people -- I know their methods of sampling, etc. So there's no proximity. I am quite sure that their findings are accurate, and I would say that the same exists for the biologists for Florida Power & Light. They may have sampled at times when conditions were such no plankton were going through. I don't know their conditions, so I'm not qualified to speak on this. This happens in biology.

So what I am going to do is simply say that it is evident that there certainly has been at least 50 percent average kill at times going through the existing condenser. I think that is realistic. And

Dr. Robert A. Stevenson

I think we can say it is fact because we have found a lot of kill at one time and none at other times.

Let's examine what would happen, and I'll just take a rough average of 50 percent. I don't care whether it is 40 or 60. I need a figure, and this seems as good as any.

I would mention two possible extremes that might occur on the hot side of such a condenser. On the one hand, the ratios -- this all important balance of predators to prey -- after they go through such a condenser may be the same. If the ratios are the same, they have at least lost 50 percent of their numbers.

Now, think what this has the potential of doing to the logistics of tiny organisms trying to find food. This would mean to me that with the 50 percent less dense biological medium in which to get food that they now have only half the chance to find the food that they would normally have, and that is dictated by their energy requirements.

Let's say, on the other side, you have a lot of organisms. Whenever you kill animals you always have some survivors, and some species are resistant, more resistant than others. I think this is more likely a situation where you would have an uneven ratio of animals on the other side where the hot water is.

Now, you have an imbalance, a great imbalance in numbers, a great imbalance in numbers and kinds of species. This is not all you have. Thinking about the 50 percent animals that are killed, plankton that are killed, you have a great potential for eutrophication. With this eutrophication you might say, "Why shouldn't these dead bodies serve as food for those that are left so they can grow up and take over real quickly.? It doesn't work that way. Chemistry is very complicated as to whether a population can boom or explode. So you have the great potential eutrophication. I don't know how much it is. I can't give you figures. I don't think we can calculate this too well. Perhaps, we can demonstrate and determine it. That is what eutrophication is.

You have the medium that is just right. One animal exploits this and then it knocks everything else out of line. The reason is that what it needs to supply it has an imbalance of other fauna and flora, particularly fauna that can meet this great explosion and keep it from coming to astronomical proportions.

This then is the substance of what I wanted to bring out. I thought that it might aid the panel because these are mechanics. It is not the whole story. There is a great deal more to it. There is no plankton. But I guess the main lesson that I have tried to show here is that the system is extremely complicated and can very easily get out of balance with these consequences. And I have tried to show you some of the mechanics on why such a thing can work.

MR. REED: Dr. Stevenson, I have a number of questions. I thank you for coming because, obviously, it has bothered the conferees -- the conflict in testimony on the possible death of plankton and larvae that have been identified coming through the condensers. Wouldn't it be possible that one of the reasons we are getting such conflicting testimony is the different measuring most of the year, where we might have a very low limit of death in the winter months, and we might have a correspondingly high death rate in the summertime in the higher temperatures where they can't stand too much increase in termperature?

DR. STEVENSON: Yes, this is a possibility. A lot of material was brought out by all biologists --

most that have spoken here. And one of these, of course -- you are asking this problem of how close you are to a thermal death point, and it doesn't take much of a rise to kill an organism. Absolutely, this is one possibility.

MR. REED: Let me ask you this. Disregarding plankton and phytoplankton, but in the larvae stages don't you suppose we could have a severe differential between death and nondeath, depending upon the development of the larvae -- how far along he was developed? He could be more sensitive at certain stages of development than at other stages of development.

DR. STEVENSON: That is correct. You see, resistance is variable from the time of birth -- I'll call that coming out of the egg. I'll call that birth. Resistance is variable until the animal dies. The animal is increasingly resistant. It gets resistant in its medium.

If you take fishes off a reef here and put them in an aquarium, you have to be extremely careful when introducing them into your aquarium. After they have been in there a week or so, you can take these fishes up and dump them in another aquarium, and they will survive. This is because of the time they have had to resist.

Now, in the planktonic stages, these things are extremely critical. There are some fish that are born that have a heavier mechanism that makes them more proficient with their environment. Otherwise, they couldn't exist, without this bonus of time given by a yolk sac by which they can get used to things. This is an extremely critical stage.

MR. REED: Have you ever studied the organic mud bank offshore of Cutler?

DR. STEVENSON: No, I haven't.

MR. REED: You haven't made a recommendation to us on a temporary limitation. Are you in a position to make a recommendation?

DR. STEVENSON: I am afraid that I am not at all, Mr. Reed. I wish I could. I would have to review all of this testimony and then think about it. All I can give you is a supposition. That is all that it is. I won't give you a figure.

MR. REED: I want a quide for future reference not specifically related or directed to the problem of Turkey Point. I want a guide for the future. Do we run into the same types of problems with plankton and larval stages if we withdraw water from the ocean, for instance, from the open ocean?

DR. STEVENSON: Yes. I would surmise that you run into an even more critical problem, because the open ocean is a much more even environment than an estuary. Estuary animals inherently should be somewhat more tough, but in the larval stages they are all extremely vulnerable. In the open ocean tolerances will be less, and I would say the problem would be more critical here.

MR. REED: I am having trouble getting there myself, but are we talking about inherently a suggestion from you, as a marine biologist, that we have to be exceedingly careful in what we allow to be an intake of a nuclear plant or conventional plant from now on as we go into the great power needs?

DR. STEVENSON: This, of course, depends upon a lot of factors. I have been listening to some of the figures presented about the amount of water that will be taken out of Biscayne Bay. This is why we are having a problem with Biscayne Bay. That is a very finite region -- a very finite region. The biota is limited in there. This is what is so critical.

Again, the figures -- I don't remember. Was it 6 days or something that the bay could be emptied, or Card Sound could be emptied?

MR. REED: You are close to it.

DR. STEVENSON: In that order of magnitude. Now, just think physically if you remove that water in 6 days, you can take every bit of that water out and throw it back in. Now, that is not the whole story; there are conditions of tide. Tide is flowing in, replenishing that water, etc. But I do state that the amount of area - you have to be careful - the amount of area from which you can potentially draw is very, very finite. You get all the water you want in because it will come over the reef from the Straits of Florida and from the Atlantic Ocean, and you will never run out; you will never run out of water. But we are talking about a system in Biscayne Bay that operates with input from the open ocean but is in itself largely self-contained.

So it just isn't that the tide flows in and brings animals, and the tide flows out and takes animals with it. The animals live there. They stay there.

There is drift, of course; there is loss, but it will recycle right in that environment. If you take vast quantities off, there are not enough to replace this. Of course, water coming in from the Straits of Florida and 5 miles, we'll say, off Elliott Key, coming across there, will bring similar organisms produced by the progeny of bottom organisms -- fish, clams and crabs. It will pick them up and bring them into Biscayne Bay up to Turkey Point. This is true.

How long can you keep doing that? That is what I mean by finite. The shelf is narrow, and finite.

MR. REED: Thank you, Dr. Stevenson. That is all the questions I want to ask.

MR. STEIN: Thank you very much.

MR. THOMAN: Thank you very much.

MR. STEIN: Mr. Reed.

MR. REED: Is there anybody else who wishes to appear? If not, I think we can end the formal session, Mr. Chairman, and go to --

WILLIAM C. STEEL, ATTORNEY AT LAW,
FLORIDA POWER & LIGHT COMPANY,
MIAMI, FLORIDA

William C. Steel

MR. STEEL: Mr. Chairman, there is one thing further on behalf of Florida Power & Light. In connection with our dual responsibility to our customers, the citizens of our service area, to protect our environment and continuously meet demands for electricity, we believe that the Board should reflect important local editorial comments on the problem here, and we, therefore, submit these 4 documents for the record.

MR. REED: We are very conscious of the editorial of The Miami Herald. We'd be glad to accept them, I am sure.

MR. STEIN: Without objection, they will be included in the record as if read.

(The above-mentioned 4 documents follow.)

The Miami Herald

JOHN S. KNIGHT, Editorial Chairman
JAMES L. KNIGHT, Chairman
LEE HILLS, Publisher
ALVAH H. CHAPMAN, Jr., President
DON SHOEMAKER, Editor
H. J. JURGENSMEYER, Gen. Mgr.
GEORGE BEEBE, Senior Managing Editor
LARRY JINKS, Managing Editor
JOHN D. PENNEKAMP, Associate Editor

6-A Thursday, February 26, 1970

EDITORIALS

Pre-Judging By Hickel

AN ULTIMATUM from Washington made a farce of everything else said at the Miami conference on the warmth of water to be allowed in southern Biscayne Bay from electric generating plants at Turkey Point.

Interior Secretary Walter J. Hickel sent the threat to go to court unless the Florida Power & Light Co. agreed to stop digging a six-mile canal to carry the heated water into Card Sound.

That, theoretically, was the whole point of the parley — whether the canal would cool the water so that it would not cause heat pollution in the bay. The rest of the proceedings consisted of statements for and against that proposition.

Witnesses were wasting their breath after the opening salvo from Mr. Hickel. His underling who served as "the moderator" pressed in vain for the outcome demanded by his boss.

With the issue prejudged from the top, the two days of talk added up to a kangaroo trial. The transcript of testimony doubtless will wind up in court. There, perhaps, a balance can be struck between the desirability of preserving natural values in the bay and South Florida's obvious need for more electricity.

Thurs., Feb. 26, 1970

THE GUIDE

1027 Ponce de Leon
Coral Gables, Fla.
661-2501

Editorials

U.S. Unreasonable On Turkey Point

In another place at another time, the Federal Water Pollution Control board's abrupt crackdown on Florida Power and Light's Turkey Point water discharge project might have been called a kangaroo court.

Even before FPL had an opportunity to present scientific witnesses and testimony in its behalf, the board ordered FPL to desist from building a five-mile cooling canal, alleging it cannot adequately lower temperatures on water gushing from the new nuclear plant.

This action flies in the face, morally and logically, of a decision made only a few days earlier by the Metro Pollution Control Board whose Ph.D. members gave the canal the go-ahead with strict provisions for supplemental protections in case the canal does not do its job completely.

Interior Secretary Hickel's cease-and desist order also contradicts a statement he made recently which would seem to support FPL's burdensome responsibility to meet crushing power needs.

"Some people he said, "think you can have untouched wilderness everywhere and at the same time have all the benefits of our modern technology.

"They refuse to recognize that the electricity that runs the window air conditioner has to come from a dam or a power plant of some kind."

* * *

ONE ONLY has to remember the tragic results of Southern Bell Telephone's underestimates of South Florida growth. FPL is trying to forestall a power shortage by maintaining lead time on expansion and construction projects.

If FPL's power demand projections are accurate, then a delay — while scientists quibble and exchange disputed data on thermal pollution — can only bring South Florida closer and closer to a re-enactment of the Southern Bell crisis, which now needs tens of millions in rate increases as a solution.

It is a man-sized burden to, on the one hand, be obligated to meet demands of an exploding population and building boom in South Florida over which it has no control, and on the other to be stalled in a thicket of agency red-tape and conservation controversy while trying to meet its public responsibility.

FPL has testified to its willingness to exhaust scientific resources finding the ideal solution.

But work must go on, lest FPL be caught with too little too late.

Better the federal board should have ordered a stop to all apartment and hotel building in South Florida while the conservation question is resolved.

NORTH DADE
JOURNAL

Wed., Feb. 25, 1970

Crackdown fair?

The federal government's lightning-fast crackdown on Florida Power and Light's water discharge systems at Turkey Point this week was a disappointing climax to a complicated scenario being played out between industry and conservationists.

Even before FPL had an opportunity to introduce witnesses and evidence, federal examiners read an ultimatum designed to stop a five-mile water discharge canal.

FPL contends it can dispute, scientifically, some of the data the board used in reaching its decision.

* * *

BE THAT as it may, what is being overlooked is that both the burden of quickly meeting explosive power demands in South Florida's building boom, and of coming up with technological guarantees that protect man's natural resources are placed on the power company and the company alone.

The history of Southern Bell Telephone's tragic underestimation of growth is a story still being lived out daily by telephone users.

FPL's planning had intended to avoid the same undersupply of service.

* * *

THE METRO Pollution Board — composed partially of PhD scientists — had a better answer.

It granted the company the right to continue developing the discharge canal, post haste, to meet power demands.

But, at the same time, the Board imposed continual monitoring on the water discharge system and options to apply more effective water cooling methods if ever required.

A federal order delaying construction, while protagonists argue over whose scientific data is accurate, does not solve the most compelling problem — how to provide power in enough quantity when people demand it.

wvcg

377 ALHAMBRA CIRCLE / CORAL GABLES, FLORIDA 33134 / TELEPHONE: (305) 445-5411

STEVE DAILY COMMENTARY

February 25, 1970

When the hearing on Turkey Point opened yesterday, it was obvious from the opening statement by the government that the hearing was a charade. Florida Power and Light had already been hung...the federal men were trying to figure an exact peg to display the body from. It's becoming equally as obvious that they're going to Islandia...the almost-but-not-quite national monument. And, Carl Klein, the Assistant Secretary of Interior, came up with a NEW verbal indictment of the Turkey Point operation. Velocity pollution. The scouring of bay-bottom by the velocity of the water at the mouth of the canal. Strange that nobody I can remember in so many past hearings has mentioned THAT one. I'm not personally equipped to say whether or not the existing facilities at Turkey Point are damaging the bay... nor am I about to become any expert on whether or not the cooling canal for the nuclear generators will be some sort of terrible destructive force on the marine life in Card Sound and the bay. None of us will. Becuase the so-called experts themselves don't agree. When you pin down most of these fellows who say the cooling canal and the tremendous volumes of water the plant will be gulping, they begin to hedge. Their final answer is usually something about as enlightening as: "Well, it just seems that it would be better not to take the chance, than to risk such damage." Columbus used to hear that same kind of thing, so the books tell us.

I know an awful lot of people who tell me they fish regularly right in the area where some people are saying in a federal report that there is acute damage. And, I'm told, the fishing is great. FP&L points out that the grasses and weeds are seasonal, and for some reason, all the pictures of bald bay-bottom seem to be taken during a natural decline. The company took it's own underwater pictures in that same area just this past week ... and it's not only beautiful ... it's teeming with fish. The television photographers who were there the other day agreed. Turns out that the same state people who are sitting on the hearing board right now THEMSELVES scuttled the idea of the least harmful alternative: an outfall to the ocean. Other alternatives are cooling towers ... which F.P. & L.'s engineers way will spray more than a hundred tons of salt an hour over the surrounding area. Then, there are cooling lakes. The company owns all that property at Turkey Point, and will put in the lakes if it has to. But it means ripping up a couple of hundred acres of the very mangrove the state and county say they want to save. And the present condition of which is now the subject of high-praise by Federal, State, Local and Independent Naturalists. It has been praised as an outstanding example of how industry can work with ... and SAVE ... the environment. That sort of stuff has appeared in almost every major newspaper in the country. The company claims the Federal Report is false, erroneous and misleading. It's attorneys say the company has met every legal requirement to date, in starting to dig the canal to card sound. One of F.P.& L.'s Vice-President's, in fact, quietly stated that he helped write a law not-yet-in effect, that puts restrictions on such project ... which the company says it's already following. The company is forecasting a severe power shortage in South Florida by June of next year, if the Turkey Point canal isn't dug ... or the plant put in operation on schedule, somehow. And, somehow, it will. But the tragedy in the present hearing is, that the federal goverment is grasping at not-quite-existing-law and circumstances, to block what appears to me to be a very well-planned operation. Fla.Power & Light is suffering from the terrible, shortsighted and slovenly approach to it's own environment shown by past state governments. And local, and, through it all sits FP&L Chairman McGregor Smith ... a dedicated, knowledgeable working naturalist and conservationist. He is suffering the torment of the damned, because he knows the company HAS considered the alternatives. And one of them is to rip, rape and decimate a work of a lifetime that is a conversationists paradise. It's called Turkey-Point. And, personally, I don't think McGregor Smith would harm one gill of any fishes skin, if he could help it. But I don't think that either the company OR the several governments involved have researched the themal-pollution sciences enough. Because through ALL these hearings in the past several years ... NO ONE really knows what the outer temperature limits of the water can really be, before the bay begins to become sterile. And THAT's the problem. They're fighting an unknown.

****

Nathaniel P. Reed

NATHANIEL P. REED, CHAIRMAN,
FLORID AIR AND WATER POLLUTION CONTROL BOARD,
TALLAHASSEE, FLORIDA

MR. REED: Mr. Chairman, I have a short statement which I would like to read.

Mr. Murray Stein, Mr. Jack Thoman, regrettably somehow lost during the last two days is the real reason for holding this conference, and that is the future of Biscayne Bay.

It is now record. The Bay and Card Sound are in perfect biological balance. Man cannot improve them. What has taken thousands of years to form can be altered in a flicker of time.

We have painfully listened to hours of testimony trying to determine a course of action. We are not here to make political gain, to damage Florida Power & Light. We are here with the awesome responsibility of making a calculated risk judgment on the future of Biscayne Bay and Card Sound.

I have a small number of recommendations to make.

Nathaniel P. Reed

1. The temperature factor is obviously critical. A safety factor must be included in our decision. The Dade County standard has little safety factor. The State standard is only enforcable after proven damage, which means complicated legal entailments.

2. Common sense dictates a huge discharge of water, even if cooled to ambient background will alter, change and possibly disrupt the hydrology of Card Sound. This action will cause a reaction which neither Federal, State, county or company experts can predict.

3. Obviously, we have a problem of great magnitude. It would be my hope that we could set some guidelines and parameters for the company, and then let the engineering companies meet those quidelines and parameters.

There may be alternative methods of solving the number of difficult problems. I think the planktonic and larval stages, which now are beginning to pose larger problems than we first anticipated, may have to be painfully reviewed by both the company and the conferees.

Personally, I hold out my hand in any way to assist those of us who are genuinely concerned and interested in the overriding goal, and that to me, sir, is the preserving of the unique quality of Biscayne Bay and Card Sound.

MR. STEIN: Thank you very much for that very excellent and eloquent statement, Mr. Reed.

This conference is typical of many -- when you get all the technical suggestions, which tend to be the nuts and bolts of a problem, you may think that you have lost the main thread. But you have kept your eye on that and I hope the other conferees have, too.

Are there any other comments or questions? If no one else wants to be heard, the conference will proceed into Executive Session.

DR. WERNER N. GRUNE,
PROFESSOR AND CONSULTANT,
UNIVERSITY OF MIAMI, CORAL GABLES, FLORIDA

DR. GRUNE: Mr. Stein, I have some diagrams to elaborate on what I was speaking of yesterday.

MR. STEIN: Will you identify yourself?

Dr. Werner N. Grune

DR. GRUNE: Werner Grune. I would like to add 3 diagrams to the discussion that I made yesterday afternoon -- to the statement I made.

MR. STEIN: May I see the diagrams?

DR. GRUNE: These are from official Department of Interior reports available to the public on this humidity cycle. That is completely closed, a completely closed air system, and no drift, which may be of some importance.

MR. STEIN: These will be included in the record as if read.

(The above-mentioned 3 diagrams follow.)

An aerial view of the city of Puerto Peñasco is shown in figure 113. The road in the upper left-hand quadrant, built by the state of Sonora, leads to the plant site on University of Sonora land. The evaporator-condenser unit for the Peñasco pilot plant, under construction at Tucson, is shown in figure 111; a flow diagram for the plant is shown in figure 112.

Sea water is pumped from the ocean at 60 g.p.m., 24 hours a day, into the condenser through the inside of admiralty tubes with type 3003 aluminum fins. The sea water serves as the coolant for condensation of fresh water; in this way, it is preheated by the latent heat of condensation. The sea water is pumped from the condenser to a 100,000-gallon storage reservoir. During the period of maximum sunshine, the sea water is pumped at 180 g.p.m. through the solar collector where it is heated further. It is then stored in another 100,000-gallon storage reservoir from which it is pumped at 60 g.p.m., 24 hours per day to the packed tower evaporator. In the evaporator, part of the hot salt water is evaporated into a moving air stream which carries the water vapor to the condenser. The residual brine is cooled by the evaporation process and falls to the bottom of the evaporator where it flows back to the sea as blowdown.

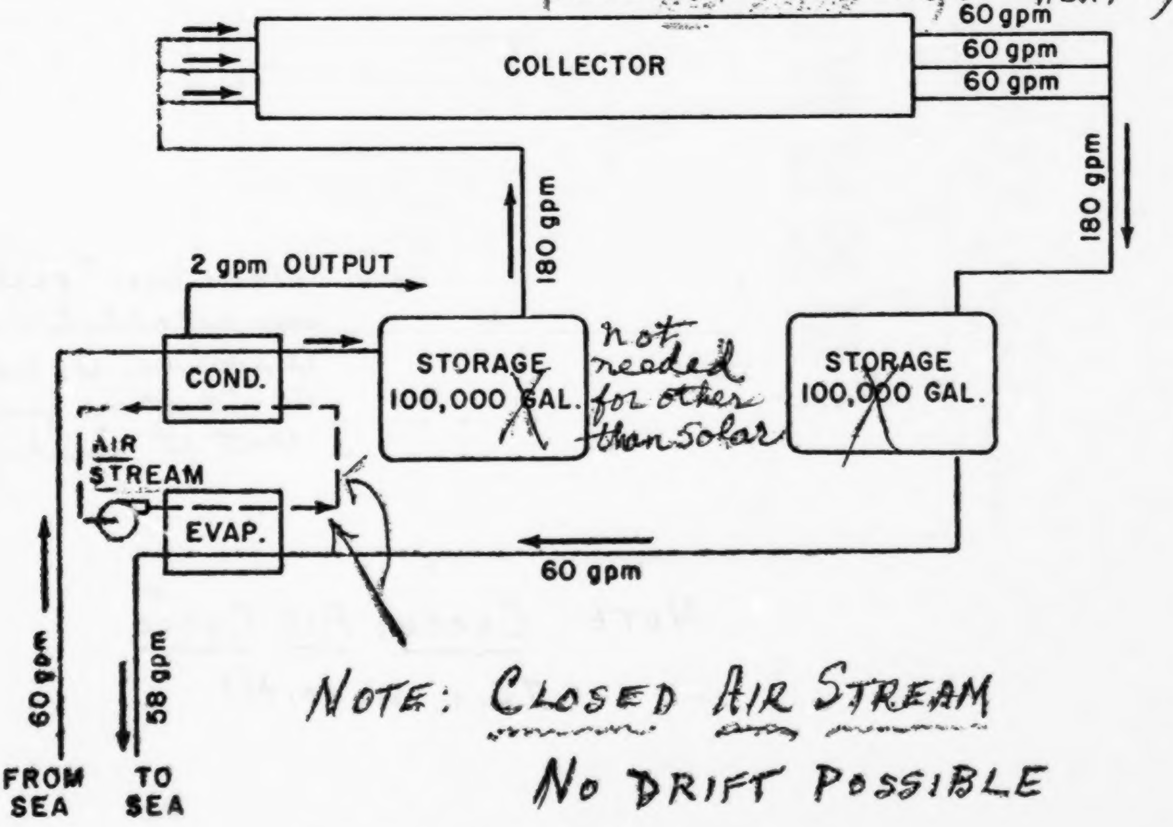
The hot water vapor condenses on the finned tubes and falls to the bottom of the condenser as pure distilled water.

The Peñasco pilot plant operates at eight effects and is expected to produce more than one-half g.p.d. of water per square foot of collector.

MULTIPLE-EFFECT HUMIDIFICATION STUDIES AT GEORGIA TECH

Research at Georgia Institute of Technology, Atlanta, has been directed toward establishing the technical and economic feasibility of multiple-effect humidification. Studies initiated at Georgia

HEAT SOURCE = (i.e. reactor cooling water) (ANY WASTE HEAT)



not needed for other than solar

NOTE: CLOSED AIR STREAM

NO DRIFT POSSIBLE

FIGURE 112.—Peñasco pilot plant flow diagram.

g analyzing the results and studying alternative and operating conditions.

ing pilot-plant operation it was realized that peed had little if any effect on extractor perice, so about half the runs were made with the off. A statistical analysis of the results shows uilibrium was obtained in every stage even mixer off. Stagewise calculations show, howat in most runs 11 theoretical stages were not l, but this was due to entrainment. Several ear the feed especially tended to flood — duced capacity and prevented operations at n conditions. Calculations indicate that a 40 increase in capacity at the same solvent rate duct quality may be obtained by a change of few degrees in the temperature profile. This a considerable increase in settling time and ot be obtained with the present plant design.

experimental work and design calculations recent months been centered on the heatlesign concept. Thermodynamic data have tained for several solvents which, because of apor pressures, are particularly adaptable to ign. The novel feature in the process as now d is that the heat of solution is removed from actor by evaporation of the solvent. The va- compressed and injected directly into the o heat it and cause phase separation. When d with a steam turbine, power can be used to run the vapor compressor and pumps, and exhaust steam used for stripping. With this design a performance ratio in excess of 25 is indicated, and an overall cost at least 30 per cent below the low-temperature design is probable. Further reduction in cost can probably be obtained by improved extractor design and more optimal operating conditions.

Field Evaluation of Solar Stills

The Solar Sea Water Distillation Research Station near Daytona Beach, Florida, operated under contract with Battelle Memorial Institute, was closed during 1965. The station had been used for several years to field-test various designs of solar stills in an effort to reduce the costs of solar distillation.

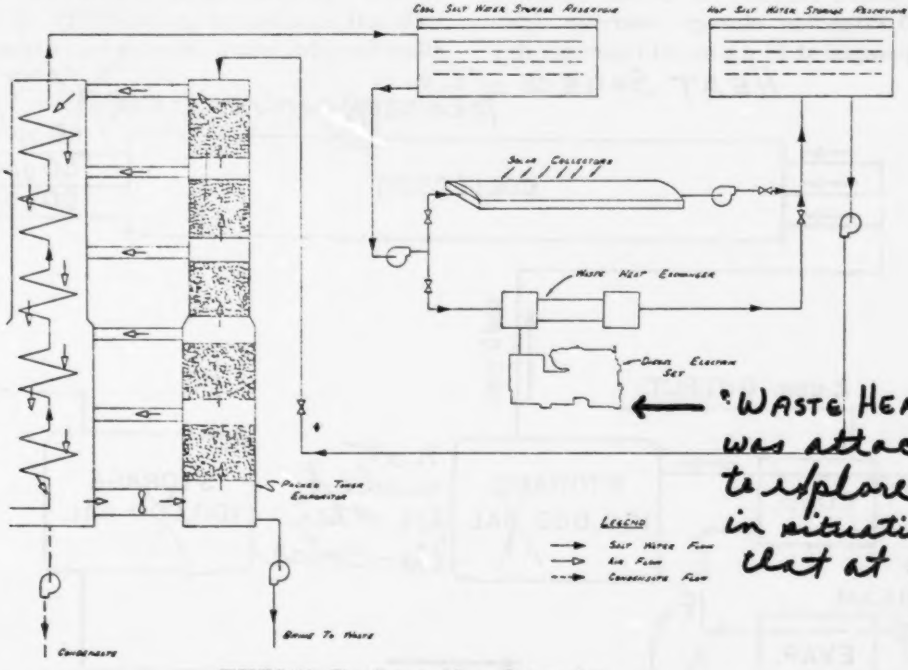
Descriptions of experimental studies on solar radiation carried out at Daytona Beach are included in Research and Development Reports published by the Office of Saline Water.

Puerto Peñasco Pilot Plant for Solar Desalination

During 1965 the University of Arizona, in cooperation with the University of Sonora, Hermosillo, Mexico operated a solar-powered pilot desalination plant at Puerto Peñasco, Sonora, Mexico.

The pilot plant was constructed in 1964 and a gener-

Efficieny of evaporator-condenser confirmed to > 8.0 effects by improved air flow distributi



"WASTE HEAT" package was attached in 1965 to explore its usefulness in situations just like that at Turkey Point

FIGURE 230.—Flow diagram of Puerto Peñasco plant.

NOTE: CLOSED AIR CYCLE

Thus, no dr. H1

Reproduced from best available copy.

CLOSED AIR CYCLE

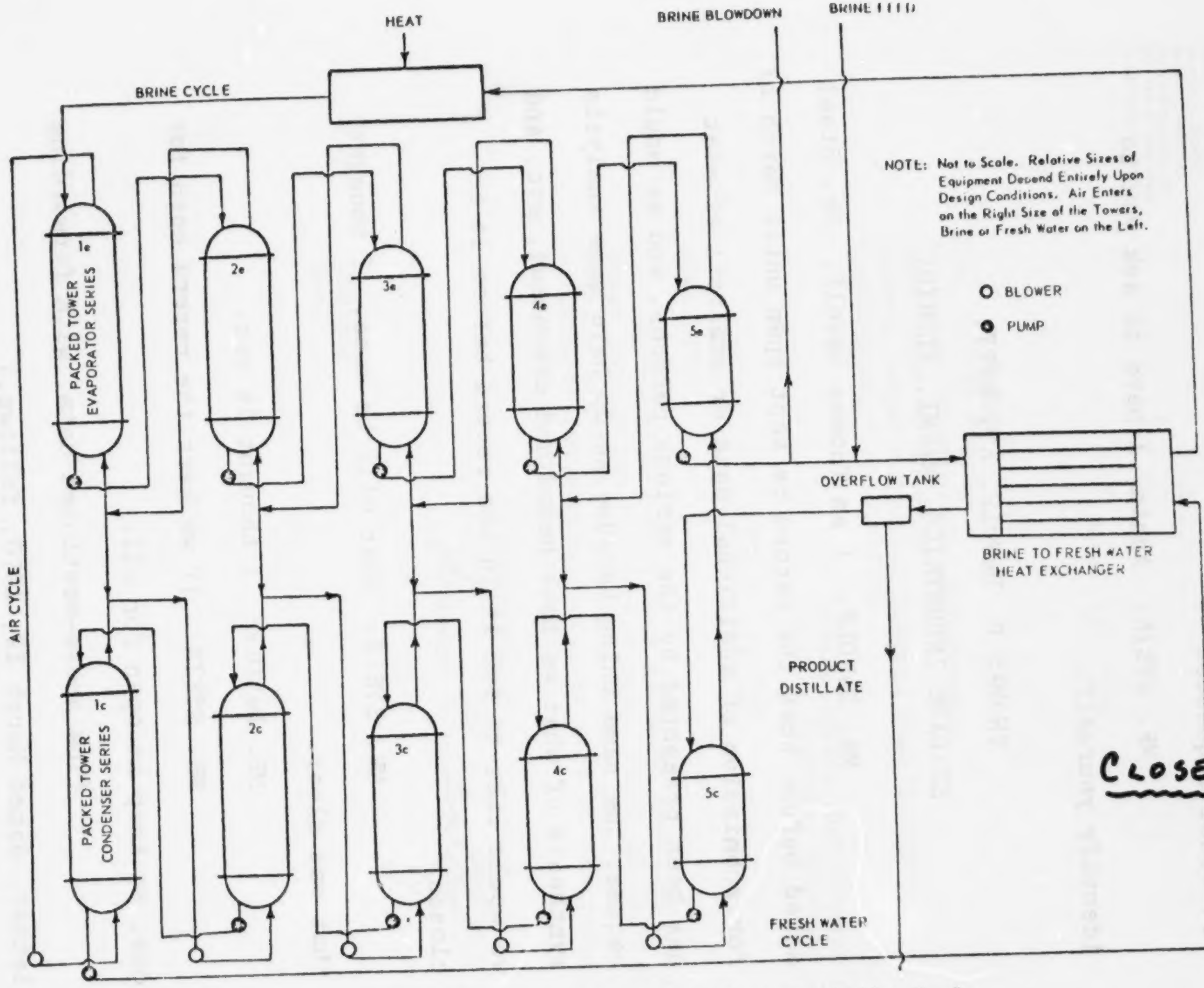

HEAT
BRINE CYCLE
BRINE BLOWDOWN
BRINE FEED
NOTE: Not to Scale. Relative Sizes of Equipment Depend Entirely Upon Design Conditions. Air Enters on the Right Size of the Towers, Brine or Fresh Water on the Left.
O BLOWER
● PUMP
1e
PACKED TOWER EVAPORATOR SERIES
2e
3e
4e
5e
OVERFLOW TANK
BRINE TO FRESH WATER HEAT EXCHANGER
AIR CYCLE
1c
PACKED TOWER CONDENSER SERIES
2c
3c
4c
5c
PRODUCT DISTILLATE
FRESH WATER CYCLE

Figure 2. Variation of Multiple Effect Humidity Cycle.

REF: to cool thermal discharges - and provide feedwater

MR. DeWOLF: Before you close it, Mr. Stein, Mr. Steel requested --

MR. STEIN: Again, I have to ask you to identify yourself.

THOMAS B. DeWOLF, ATTORNEY,
SEADADE INDUSTRIES, MIAMI, FLORIDA

MR. DeWOLF: I am Thomas DeWolf. Mr. Steel asked before that the record be kept open until March 13 for submission of additional data or analysis of what has been presented by the various persons, and we would request the same thing because we do have some analysis synthesis of what we have heard and discussed, etc, and we would like to put it in the record before it is closed.

MR. STEIN: That will be done. I thought that was clear.

MR. DeWOLF: I thought it was.

MR. STEIN: If we keep the record open for one, we keep it open for all.

(The above-mentioned data, with forwarding letter, dated March 12, 1970, follows.)

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TELEPHONE (305) 241-2521

March 12, 1970

Hon. Murray Stein
Assistant Commissioner Enforcement
Department of Interior
Federal Water Pollution Control Administration
Washington, D. C. 20242

Re: Federal-State Enforcement Conference
Miami, Florida, February 24, 1970

File: 10.258

Dear Sir:

Enclosed herewith is a document entitled "Cooling Tower Evaluation for Turkey Point Plant of Florida Power & Light Co.", which is hereby submitted on behalf of Seadade Industries, Inc., as part of the record of the above referred conference.

Respectfully,

Thomas B DeWolf

For the Firm

TBD:nsa
Enc.

COOLING TOWER EVALUATION
FOR TURKEY POINT PLANT
OF
FLORIDA POWER & LIGHT COMPANY

for

Seadade Industries, Inc.

by

Peter M. Phelps

March 1970

INTRODUCTION

A Federal-State hearing was held in Miami, Florida during the week of February 22, 1970, the purpose of this meeting being to hear discussions on thermal effects of contemplated condenser water cooling systems for the Turkey Point plant of Florida Power & Light Company. During these discussions, certain information was put forth as to applicability of water cooling towers for this project. Considerable emphasis was placed on potential effects of salt water cooling towers on areas in and around the plant.

It is the purpose of this report to put forth certain information on cooling tower design and operation techniques which can substantially improve the condition of ambient salt contamination should salt water cooling towers be utilized at Turkey Point. This in no way is meant to rule out the use of fresh water cooling towers, or even brackish water towers, if investigations prove that adequate supplies of fresh water are available to make up the losses associated with operation of the cooling towers. Obviously, use of fresh water is the best way to circumvent any problems of salt contamination. In the event that fresh water is not available, and salt (bay) water must be considered, it is hoped this report will offer information on operating techniques not presented at the above hearing which can act as a guide to development of a feasible cooling tower system for Turkey Point.

The report excludes any reference to so-called "dry" cooling towers. Any discussion of such towers must of necessity bear heavily on the experience gained on the installation at the CEGB Rugeley power plant in England. Since the economic evaluation of that tower hinges on use of a different type of condenser than is used at Turkey Point, there is very little relatability between the two installations. The report also excludes any reference to "wet" cooling towers of the natural draft ("hyperbolic") configuration. Time does not permit development of data for such a discussion. Suffice to say that natural draft cooling towers can be used, even though atmospheric conditions at Turkey Point are not particularly favorable. It should be understood that these towers will perform at very low drift or carry-over rates from the top of the tower (some manufacturers state 0.01% of the total water circulation), however they can be quite sensitive to such losses from the inlet areas, particularly when wind blows during the summer months. An advantage of this type of cooling tower is its tendency to perform better in cool winter months than some types of mechanical draft towers.

This could be of benefit in achieving the relatively difficult criterion of cooling to within 4° of the winter bay temperature.

The discussion is based on operating with conventional mechanical draft cooling towers. For sake of comparisons, the ten 10-cell towers as laid out in the Southern Nuclear Engineering report of February, 1970 (a copy of which has been made available to the writer) will form a basis for this discussion. No specific size of cell nor internal configuration has been assumed, but for the sake of the discussion the overall size and the number of cells will generally follow the layout in the above report. Variations introduced through differences in construction from one manufacturer to another will not materially affect the concepts presented in this discussion.

Correlation between bay water temperature, plant load, and air temperatures influencing cooling tower operation have not been made, due to absence of interrelated data. Typical conditions have been calculated however, and are covered in the discussion.

In all cases, desired temperature of water off the cooling tower system is assumed to be 1½° above bay water temperature for the "summer" months of May through September, and 4° above bay water temperature for all other months of the year. It is possible to make the change from summer operation to winter operation almost instantaneously, however a gradual transition over a period of days may be a more desireable way to accomplish this.

DISCUSSION

It is understood that the maximum condenser design load calls for 1,876,000 gallons per minute (GPM) of water to be heated 15.2° in the condensers. The basis for this design is assumed to be sea water. For the cooling tower selection, it is presumed here that the summer bay water design criterion of 90° F. governs the water temperature entering the condensers and thus 105.2°F. is the leaving temperature. These temperatures are slightly higher than values previously specified, and thus may have a slightly adverse effect on plant heat rate, however the plant has already operated at 108° F. or more, and therefore could no doubt operate satisfactorily at 105.2° design. The 15.2° rise (and 105.2° leaving temperature) could be reduced by increasing the water flow rate (ie dilution), however any such increase would potentially add to the amount of water subject to drift from the cooling tower and would possibly increase velocity effects from the once-through systems where water is recycled through the bay. Such a recycle system forms the basis for the salt water systems discussed herein. By recycling through the bay, it is assumed that the build-up in salt concentration as water is evaporated will be dispersed by bay currents along with the 1½° higher (summer) return water temperature. It could be necessary to blow down part of the return water to more "open" areas of the bay to ensure that there is no temperature or salinity build-up in the bay adjacent to the plant, but such an evaluation is not within the scope of this report. It should be emphasized, however, that evaporation is an inevitable result of a cooling tower (or a pond) system. Thus, the net result will be an increase in the salinity level of the bay, even though this may be a negligible amount. To carry this to the extreme, even a fresh water cooling tower will result in some increase in bay salinity, since about the same amount of water would be evaporated whether it went through the tower first or whether it flowed into the bay first and then was pumped back to the tower as salt water. It is assumed of course that fresh water blow-down would flow into the bay, and that evaporated water would not return directly as rain fall. That portion of the bay which would be included in this recycling "closed" system can not be designated, pending definition of where the "system" should stop and where the bay starts. Some portion of the bay must be included, however, if for no other reason than to allow for dilution of the return water in the event of cold bay temperatures in the winter (too cold to be approached within 4° by water off a cooling tower system). Further investigation might prove such dilution to be desireable for summer months as well.

Air temperatures for this discussion are assumed to be typically comparable to data from the Air Weather Service at Homestead AFB. Air wet bulb temperature coincides with the minimum temperature to which water can be cooled in a cooling tower (approached but never practicallly achieved). The wet bulb temperature recorded at Homestead AFB never exceeded 80°. Other data for Miami shows 81° being exceeded only two hours per year. 80° has therefore been chosen as a reasonable and quite conservative design basis. The plant cooling load at maximum capacity thus becomes 1,876,000 GPM sea (bay) water cooled from 105.2° to 90° at an 80° wet bulb temperature, assuming concurrence with an 88.5° bay temperature. An evaluation has been made for this load applied in a straightforward manner over 10 banks of cooling towers at 10 cells per bank (100 cells). An alternate evaluation has been made whereby 15 banks of cells (150 cells) have been utilized. The purpose of this alternate is to improve winter water discharge temperatures, and to permit spreading the load over a larger cooling capacity. This larger cooling capacity will reduce tower design air velocities (and thereby reduce drift), or alternatively will permit by-passing of some of the water around the cooling towers, thereby areas of concern in a salt water cooling tower, it should be so designated and designs should be evaluated on this criterion in addition to the usual evaluations associated with fresh water type towers. It is not within the province of this report to designate specific design values, since guarantee for such values must lie with the manufacturers. A definition of what can be tolerated is of course of paramount importance in approaching the problem. Once such a definition has been made, the manufacturers of cooling towers and tower components can do a proper job of tackling the problem. As an example of what might be done, located in Florida Power & Light's own territory at Fort Myers, Florida is a company which with its European affiliate is the world's largest independent producer of fill for cooling towers. This company, Munters Corporation, also serves as the American agent for a European company which builds what are probably the most sophisticated drift eliminator systems ever offered for cooling tower service. As one example of the capability of these firms, it is believed they would probably agree to design and guarantee a drift eliminator system for either cross flow or counter flow types of cooling towers which would reduce the drift eliminator loss to about 0.003% of the water being circulated. On a flow of 1,900,000 GPM this would reduce the drift eliminator loss to under 60 GPM. This would be only one sixtieth (1/60) of the drift loss assumed to be a reasonable value for conventional tower designs (at 0.05%). It is less than 1/3 of the 0.20% drift eliminator loss to be expected on the hyperbolic type of tower. It is equivalent to less than 15 pounds of salt per minute on a sea water basis.

Once having designed a cooling tower of optimum air velocity and drift eliminator design, the next step would be to establish operating techniques to minimize the time during which fans must be operated at high speed. A number of examples have been calculated to illustrate some of the advantages of doing so. In all cases, it is assumed there will be a net heat transfer of zero between the bay and the cooling tower water, other than the purposeful dilution that might be required in the winter. In other words, for the operations discussed below, unless otherwise stated, there is assumed to be zero cooling by dilution with bay water and zero heating by recycling and reheating of residual bay water. Specific drift values will not be given, due to the many variable factors between one drift eliminator design and another. An idea of the amount of reduction in drift can be determined, however, by comparing the number of towers out of service or operating at half speed on the fans. Reduction in drift will be simple to predict for towers cut out of operation, since losses from the towers will be eliminated when they are shut down. Drift reduction will not be quite to dramatic for the towers operating at half speed on the fans, however drift eliminator losses can be expected to approach natural draft levels even with "conventional" drift eliminators, and heavy "in-plant" droplets will be virtually eliminated.

Where possible, wet bulb temperature is related to plant load from Turkey Point data sheets dated May 31, 1969 through July 19, 1969. This data can only serve as a rough approximation, however. The effects of variations in plant demand, air temperatures, water quantities, etc., are not recorded. It is assumed from this data that a 15° condenser temperature range represents full load on the plant. Variations in load were recorded in the following amounts:

Temperature Range, °F.	Percent Of Time
15	0.4
14	2.7
13	17.2
12	14.5
11	8.1
10	10.1
9	7.7
8	9.2
7	14.1
6	10.4
5	5.4
4	0.2

Where no readings were indicated on data sheets, a temperature range was assumed by interpolation, based on

KW demand at that time. This data indicates that partial cooling tower operation should be feasible a large percentage of the time.

A: 10 COOLING TOWER CONCEPT

1: 80° Wet Bulb Condition

Existing plant load appeared to vary from a condenser range of about 10-12° up to 15° at the time of day when the wet bulb would be expected to be highest, in mid to late afternoon. This period of the day coincides with maximum power load, for the most part.

For a full load of 15.2° condenser range on the new plant (total four units), all towers must of course operate at full fan power. Should the plant load drop to 12°, one tower can be cut out of service or alternatively two towers cut to the half fan speed condition.

Should the plant load drop to 10°, it would still be necessary to operate 9 towers if all on full fan power, but for the half speed operation a third tower could be cut to the half speed condition.

2: 70° Wet Bulb Condition

A 70° wet bulb condition would most likely be synonymous with the spring and fall months of March, April, May, October, and November. In late fall in particular, this mean wet bulb temperature would vary the most, peaking in the afternoon but dropping by 3 - 4° at times of minimum temperature in the early morning. Expected power plant load during these months in not known, but undoubtedly is well below peak summer loads. Likewise, bay temperature is not known, but is undoubtedly lower than the 88½° summer peak.

Assuming a summer criterion (1½° differential), if the bay is 88½° and plant load is the maximum 15.2°, it would still be possible to operate 8 towers at full fan power and 2 off, or alternatively with 4 towers on full power and 6 at half fan speed.

If the bay is 88½° and plant load is 10°, the plant could be operated with 6 towers on full power and 4 off, or alternatively with all towers at half fan speed.

If, as is more probably true, the bay temperature will drop nearly as much as the air temperature, and assuming this bay temperature to be reduced by 8° (to 80½°), when the wet bulb is reduced to 70°, the following conditions will hold.

If the plant load is full at 15.2° over the condensers, all towers at full power will still fall short of the summer 1½° criterion (83½° water) but will easily achieve the winter 4° criterion.

At a 12° plant load, all towers at full power will deliver the required 82° water for the summer criterion. The winter criterion can be met with 7 towers at full power and 3 towers at half fan speed.

If the plant load drops to 9°, the summer criterion of 1½° can be met by operating 9 towers at full power and 1 off, or alternatively 7 towers at full power and 3 at half fan speed. The winter criterion or 4° can be met by operating 8 towers at full power and 2 off, or alternatively 3 towers at full power and 7 at half fan speed.

If the plant load drops to 7½°, the summer criterion of 1½° can be met by operating 8 towers at full power and 2 off, or 5 towers at full power and 5 at half fan speed. The winter criterion of 4° can be met by operating 7 towers at full power and 3 off, or 2 towers at full power and 8 at half fan speed.

3: 60° Wet Bulb Condition

It is assumed that winter bay temperatures will be in effect at all times during 60° wet bulb conditions, which normally occur only in January and February. This period represents a critical time for the cooling tower. At full power, the cooling tower water may still require substantial amounts of dilution with cold bay water to approach within 4° of the bay water temperature. Conditions would be as follows:

Load	Temperature Off Towers	Minimum Bay Temperature
15.2°	78°	74°
10	74	70
7.5	71	67

If bay temperatures are lower than above minimums, dilution will be required.

B: 15 COOLING TOWER CONCEPT

This concept involves a higher expenditure for cooling towers in order to achieve a reduced water or air loading on the tower and thus reduce drift. The most straightforward approach would be to spread the water "thinner", over 15 towers instead of the 10 towers in Concept A, thus merely reducing required air velocities through these towers. Such an artificial increase in tower size over that of the conventional type would probably open up the design to other changes as well, particularly in type of tower internal packing, and it is thus felt that this analogy may not be a realistic comparison with Concept A. On the other hand, there is another approach to the 15 tower concept which can be more closely compared to Concept A. This entails by-passing part of the water around the towers and cooling the remaining water to the maximum capability required. The two streams would then again be joined before returning to the bay. This may not be as practical a scheme as the above "thinning", but it does provide a means for directly comparing the larger tower system with the smaller tower system. At plant design of 105.2° from the condensers and 90° returning to the bay at an 80° wet bulb, a by-pass of 500,000 GPM of water has been selected, thus necessitating that the towers cool the 1,400,000 GPM balance from 105.2° to about 85°. This system not only reduces drift compared to Concept A, but can also improve (reduce) the water temperature returning to the bay in the winter compared to Concept A.

1: 80° Wet Bulb Condition

As in Concept A, full power is required on all fans to achieve desired cooling at 15.2° range.

Should the plant load drop to 12°, one tower could be cut out of service, or alternatively 4 towers cut to half fan speed.

Should the plant load drop to 10°, 2 towers could de dropped from service, or 9 towers cut to half fan speed.

2: 70° Wet Bulb Condition

Assuming the summer criterion of 1½° and 88½° bay water, with a full plant load of 15.2° three towers could be dropped from service, or alternatively all towers could be put on half fan speed.

If the plant load drops to 10°, five towers could be dropped from service and the balance run at full fan speed, or alternatively three towers could be dropped from service and the balance run at half fan speed.

If the bay temperature is again dropped by 8° to 80½°, a full load of 15.2° across the condensers will require that all fans be operated at full power, and even then water returning to the bay might be about ½° too warm to satisfy the summer criterion of 1½°. The winter criterion could of course be easily achieved.

If the plant load is cut in half, even the summer criterion of 1½° could be easily achieved by either cutting three towers out of service or alternatively operating all towers at half fan speed.

3: 60° Wet Bulb Condition

Once again, this is a critical condition for the cooling tower, although not to the extent experienced in Concept A. Conditions for Concept B would be as follows: (All fans at full power)

Load	Temperature Off System	Minimum Bay Temperature
15.2°	75°	71°
7.5	69	65

Dilution would be required at bay temperatures below those indicated.

From the above discussion, it can be seen that through the utilization of certain operating techniques the drift loss from a mechanical draft cooling tower can be significantly improved. This would be particularly true in the case of a purposely oversized tower. These techniques coupled with a high efficiency drift eliminator design, use of high efficiency (low air rate) fill, and overall tower designs particularly suited to minimizing drift loss, should make a cooling tower installation feasible for the Turkey Point plant. As previously mentioned, if fresh water is available there is no better way to accomplish the required cooling. But if salt water must be used, the cooling tower can still be engineered to achieve salt drift levels far below any of the quantities previously considered using conventional fresh water tower designs. For example, assuming the drift level of 0.003% to be attainable, and taking full advantage of operating techniques, it would no doubt be possible to reduce average design salt drift to around 5 tons per day.

There is no reason to believe that concepts presented herein represent the optimum arrangements for accomplishing the required cooling at the Turkey Point plant. These systems and associated information were developed over a very short period of time and undoubtedly can be improved upon through a concerted effort by qualified parties.

CONCLUSIONS

1- If fresh water is not available for use in cooling towers at the Turkey Point plant, salt water towers can be designed to maintain workable low levels of salt drift loss from the cooling towers.

2- Operating techniques whereby individual towers are cut out of service or fans thereon are cut to half speed will provide a means to further reduce drift loss.

3- Oversize design, compared to conventional cooling tower sizing, can provide the means to reduce cooling air requirements, and further improve drift conditions.

4- The problem of designing a suitable cooling tower should be placed before all manufacturers who have in any way demonstrated capability in the areas of greatest concern.

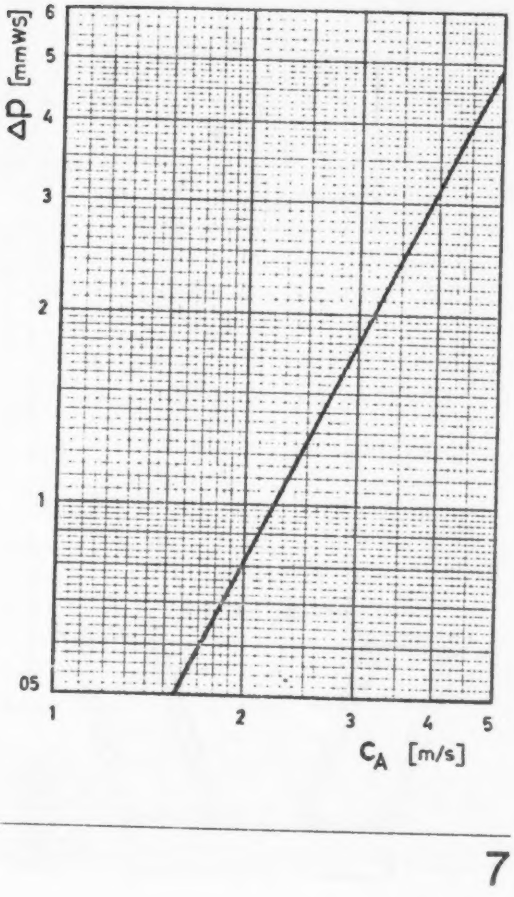
5- Design criteria must be specified for these areas of concern.

6- Mechanical draft cooling towers provide flexibility that will enable many operational techniques to be employed. Natural draft cooling towers, though less flexible and perhaps sensitive to wind induced inlet drift, may offer advantages in operation during winter months.

7- Continued investigation of cooling tower systems for the Turkey Point plant could well result in development of other and better systems than those presented in this report.

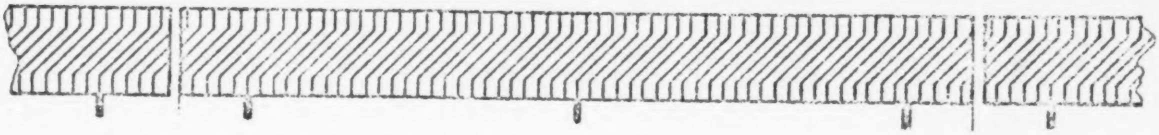
Efficiency

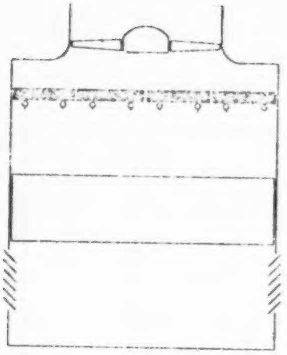
At normal operating conditions the drift eliminator T71 has an efficiency of over 99%. Yet it is more significant to state drift loss which rates from 0.1 to 1.0 gram water per m^3 air. Its amount depends on air velocity, water load and water distribution system. In general, drift loss comes to less than 0.1% of circulating gpm. At extreme conditions, for example in acid cooling towers, the drift eliminator, composed of 3 layers stacked one above the other, attained a drift loss of less than 0.002%.

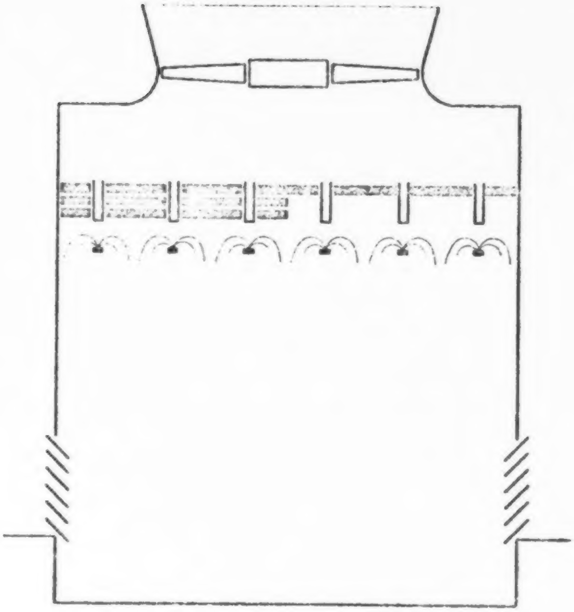


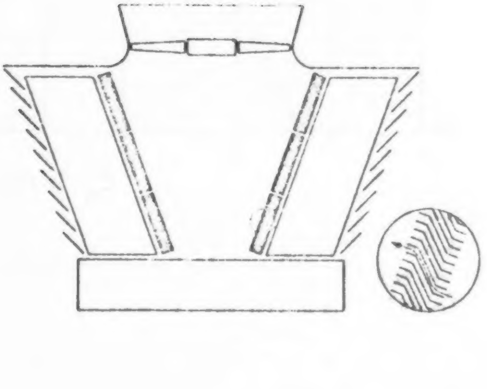
Pressure drop △ p

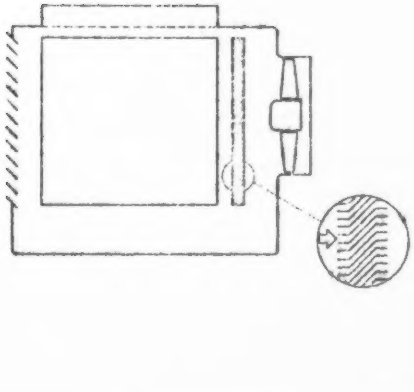
(mmWG) as a function of air velocity c_A (m/sec.)

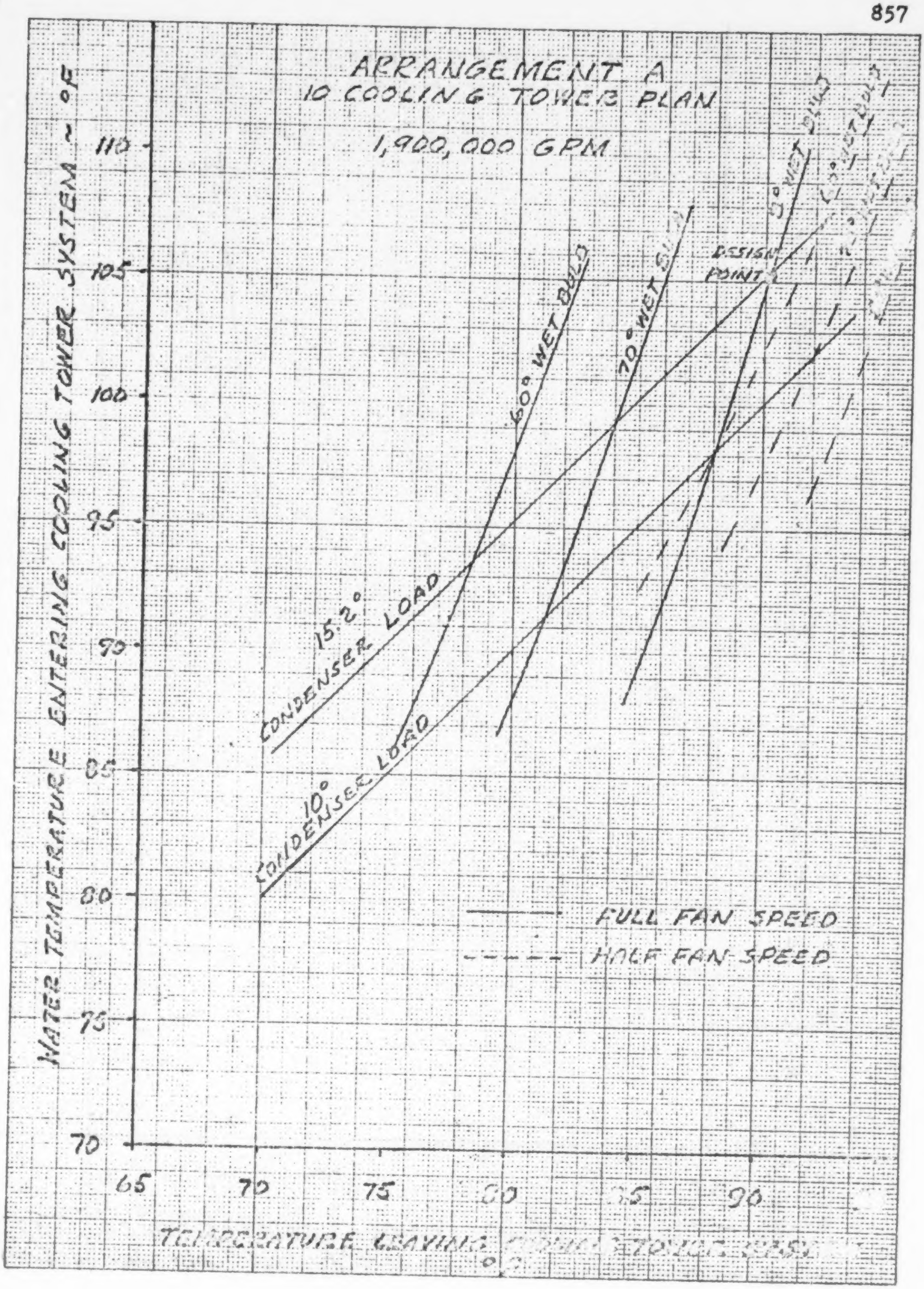


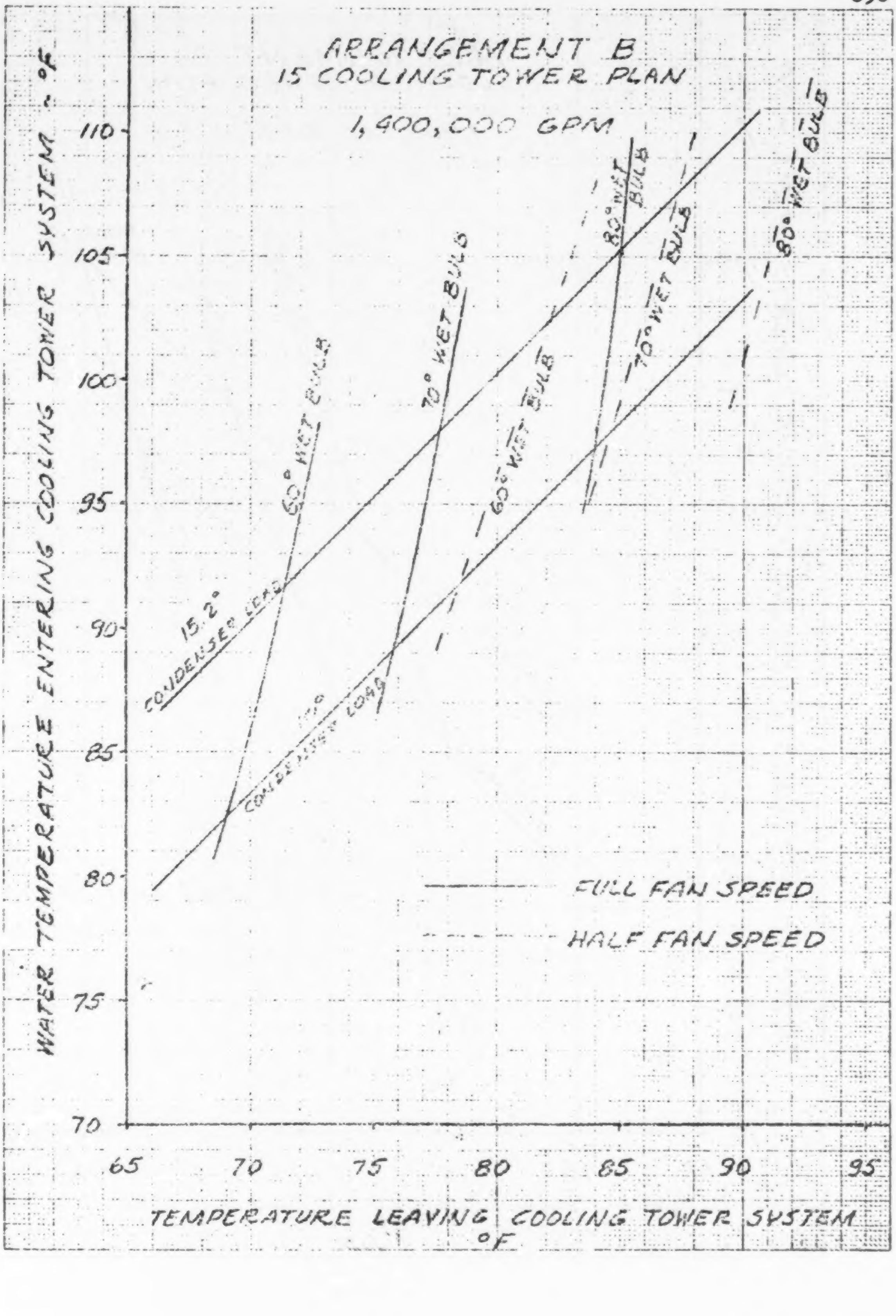









ARRANGEMENT A
10 COOLING TOWER PLAN
1,900,000 GPM
WATER TEMPERATURE ENTERING COOLING TOWER SYSTEM ~ °F
110
105
100
95
90
85
80
75
70
65
70
75
80
85
90
TEMPERATURE LEAVING COOLING TOWER BASIN
°F
60° WET BULB
70° WET BULB
80° WET BULB
DESIGN POINT
15.2° CONDENSER LOAD
10° CONDENSER LOAD
FULL FAN SPEED
HALF FAN SPEED


ARRANGEMENT B
15 COOLING TOWER PLAN
1,400,000 GPM
WATER TEMPERATURE ENTERING COOLING TOWER SYSTEM - °F
TEMPERATURE LEAVING COOLING TOWER SYSTEM °F
70
75
80
85
90
95
100
105
110
65
70
75
80
85
90
95
15.2° CONDENSER LOAD
CONDENSER LOAD
60° WET BULB
70° WET BULB
80° WET BULB
60° WET BULB
70° WET BULB
80° WET BULB
FULL FAN SPEED
HALF FAN SPEED

PAUL W. LEACH, DIRECTOR,
DADE COUNTY POLLUTION CONTROL,
MIAMI, FLORIDA

MR. STEIN: Mr. Leach.

MR. LEACH: I am Paul Leach, Pollution Control Director of Dade County.

Mr. Stein, we would like to submit for the record, since it will be held open, the entire proceedings of the Pollution Control Hearing Board for your use.

MR. STEIN: All right. Those will be accepted as an exhibit.

(The above-mentioned transcripts, marked Exhibits 5, 5a, 5b, 5c, 5d, 5e, 5f, 5g and 5h are on file at Headquarters, FWPCA and the Southeast Regional Office, Atlanta, Georgia.)

Are there any other comments or questions? If not, and if it is agreeable with the conferees, we will proceed to the Executive Session.

Summary and Conclusions

EXECUTIVE SESSION

I would suggest this procedure. We have a statutory obligation to cover certain points in the conference. I pointed this out at the beginning.

1. Occurrence of pollution of navigable waters subject to abatement under the Federal Act;
2. Adequacy of measures taken toward abatement of pollution; and
3. Nature of delays, if any, being encountered in abating the pollution.

The next one, we have to determine, or the Secretary has to determine is that if reasonable progress is not being made, he should take further action. So the conferees usually have come up with a recommendation to the Secretary from which he can judge whether reasonable progress is being made.

I would also suggest that we go over these points, that the secretaries get them typed, the conferees review them here and we will then get a final copy with any modifications. This will be the summary.

Let me go to the first point.

Summary and Conclusions

1. Occurrence of pollution of navigable waters subject to abatement under the Federal Act.

In discussions with the conferees as this has been proceeding, I think I have sensed a consensus. But I am just going to put this material out for a draft and you can decide what you want to do about it.

(To reporter) Would you take this down, please?

1. Severe damage has occurred to the aquatic plant and animal population of Lower Biscayne Bay due to the present heated effluent from the Turkey Point plant of the Florida Power & Light Company. This constitutes pollution which is subject to abatement under Section 10 of the Federal Water Pollution Control Act.

This also constitutes pollution in violation of the State of Florida and Federal Water Pollution Control Administration standards, particularly those provisions relating to damages caused by increases in temperature and the antidegradation provision.

MR. REED: My only question on that, Murray, we are involved in a maximum of 670 acres of bottom in a very large bay. We have had severe local damage. I don't think the company, the county or the State or the Federal Governments disagree on that.

Summary and Conclusions

MR. STEIN: Do you want to change it and put the word "local" in?

MR. REED: I think it is more descriptive of the problem.

MR. REED: I think it is more descriptive of the problem.

MR. STEIN: Is that agreeable with you?

MR. THOMAN: Yes. "Severe local damage?"

MR. STEIN: "Local" after "severe" and "damage," when we start.

Point No. 2. Adequacy of measures taken toward abatement of pollution.

Don't put this -- you can start now.

"Measures taken toward abatement of this pollution are not adequate. The present proposed plan to take large quantities of heated water through a 6-mile canal to Card Sound is not acceptable."

That is the end of 2.

MR. REED: I think we are painfully aware that we are transferring one problem to another site, without fully having evaluated the alternatives which are available -- engineering alternatives that are available -- regardless of testimony to the contrary.

Summary and Conclusions

I feel that the Card Sound canal could only be chosen after failure of engineering firms involved to come up with an on-site solution. I can't believe that there is not an on-site solution.

MR. STEIN: Do you want to modify that?

MR. REED: No. I would like to comment. I want to comment on the conferee's report.

MR. STEIN: Thank you. Now, the next item that we have is:

3. Nature of delays, if any, being encountered in abating the pollution.

"Because of the selection of the site of the Florida Power & Light Company plant at Turkey Point, considerable technical difficulties are being encountered in the disposal of the heated cooling water. Consequently, considerable delays have been encountered in abating the pollution."

MR. REED: "Have been and will be."

MR. STEIN: "And will be."

MR. REED: I think they are inevitable.

MR. STEIN: Is that all right?

MR. THOMAN: Yes.

MR. STEIN: Now, I have some more general points before we get specific.

The next is 4. "The State of Florida, the Department of the Interior, and the Corps of Engineers shall coordinate their views before any permit is issued which would permit the discharge of waters into Biscayne Bay or Card Sound."

MR. REED: Which is required by statute.

MR. STEIN: Right.

Next, 5. "Quality of the waters, including the biological balance, of Biscayne Bay, shall not be impaired to the detriment of the full enjoyment and use of the Biscayne Bay National Monument."

MR. REED: No problem with that.

MR. THOMAN: None.

MR. REED: Does that include the biology of the bay?

MR. STEIN: Yes.

MR. THOMAN: That is one of the stated purposes of the Act.

MR. REED: I don't think -- I didn't think the statement included the biological balance of the bay.

MR. STEIN: It was included.

May we go on with the next number.

Summary and Conclusions

"6. The Florida Power & Light Company shall abate the excessive waste heat load being discharged from its Turkey Point powerplant to the following levels: The monthly mean of the maximum daily temperatures shall not be raised more than 4°F during the fall, winter and spring, (October through May) or 1.5°F during the summer (June throuugh September). On the basis of existing data, this means that existing discharges shall not exceed 90°F at any time."

MR. REED: You are going to have to put in there 1½°. You are going to have to put in there the possibility, although not recorded at this time, of an ambient background in excess of 89°. You are going to have another sentence following that 90°F unless the ambient background exceeds 89°F.

MR. STEIN: I thought I put the hedge in. If I didn't, then we'll have to redo it. "On the basis of existing data this means."

MR. REED: I see.

MR. STEIN: If the existing data shows something else, the second sentence is the explanatory one. The first sentence is the operative one -- the 1½°.

However, we are pointing out: On the basis of existing data, this is what this means to us now. If the ambient temperature should prove to be higher than the discharge.

Now, the next number.

"7. The Florida Power & Light Company shall not discharge waters at such velocities, in such amounts, or at such points as to change the hydrology of the receiving waters to the detriment of indigenous biota."

Are there any comments on that?

MR. THOMAN: Can we include "anything on the water coming in?"

MR. STEIN: I thought we did that with the Biscayne Bay National Monument. At least, speaking for myself, I am not prepared at this time to make a statement on that under the Federal Water Pollution Control Act.

The next point.

"8. Florida Power & Light Company shall report to the conferees within not later than 60 days from today on its proposal to meet the requirements specified above."

MR. REED: That will be, obviously, no detailed engineering plan. That would, obviously, be for preliminary plans.

MR. STEIN: Preliminary plans would be enough. If they could have any detailed engineering, obviously, it would be appreciated. Detailed engineering plans would not be required, but a judgment of a plan that would work.

MR. THOMAN: Do we want to try to arrive at some figure for detailed engineering plans, or cover that in the 60-day period?

MR. STEIN: I think we can cover that in the 60-day period.

MR. REED: I do, too.

MR. STEIN: I think unless we -- this is just my view. Unless we get the extent of the plans, and I have heard some pretty grandiose alternate plans put up, I don't know that you can make a judgment of how long the detailed engineering will take.

MR. THOMAN: The company is protected in one of the disclaimers about occurrence of damage.

MR STEIN: That is right.

Now, the next point.

"9. The conference may be reconvened by the chairman after consultation with the conferees, or the chairman after such consultation may call a progress meeting."

Summary and Conclusions

MR. REED: Right.

MR. STEIN: Let us recess now until we can see that in typed form. Then we'll come back and reconvene the meeting.

(Whereupon, a short recess was taken, at the conclusion of which the Executive Session was resumed as follows.)

MR. STEIN: Let's reconvene.

There is one editorial change in 1. It should read "in temperature." We have "provisions" twice. "Particularly those provisions relating to damages caused by increases in temperature (semicolon), and the anti-degradation provision."

We will read this whole thing again when we are through.

No. 2.

MR. REED: Present measures or proposed?

MR. STEIN: Present.

MR. THOMAN: In the second setence take out "present."

MR. STEIN: "Have been and will be." There should be an "and" in the next. "State of Florida, the Department of the Interior and the Corps of Engineers."

Summary and Conclusions

No changes in 4, except for the "and."

Quality of the waters. Strike "of the Bay." We have "biological." Should it be "biological?"

MR. REED: Biological is all right. It is Biscayne National Monument.

MR. STEIN: That's right. Thank you.

In 7, "at such point so as to change."

MR. THOMAN: Change it and take the "so" out.

MR. STEIN: Strike out "within," the first word, second line. Scratch "within."

Let me try to read this again, and then we will give the conferees an opportunity to make a final statement if they wish.

These are the unanimous conclusions and recommendations of the conferees, and I am very happy to announce that the conclusions and recommendations are unanimous.

1. Severe local damage has occureed to the aquatic plant and animal population of Lower Biscayne Bay due to the present heated effluent of the Turkey Point plant of the Florida Power & Light Company. This constitutes pollution which is subject to abatement under Section 10 of the Federal Water Pollution Control Act. It also constitutes pollution in violation of the

Summary and Conclusions

State of Florida and Federal Water Pollution Control Administration standards, particularly those provisions relating to damages caused by increases in temperature and the antidegradation statement.

2. Present measures taken toward abatement of this pollution are not adequate. The proposed plan to take large quantities of heated water through a 6-mile canal to Card Sound is not acceptable.

3. Because of the selection of the site of the Florida Power & Light Company plant at Turkey Point, considerable technical difficulties are encountered in the disposal of the heated cooling water. Consequently, considerable delays have been and will be encountered in abating the pollution.

4. The State of Florida, the Department of the Interior and the Corps of Engineers shall coordinate their views before any permit is issued which will permit the discharge of waters into Biscayne Bay or Card Sound.

5. Quality of the waters, including the biological balance of Biscayne Bay, shall not be impaired to the detriment of the full enjoyment and use of the Biscayne National Monument.

Summary and Conclusions

6. The Florida Power & Light Company shall abate the excessive waste heat load being discharged from its Turkey Point powerplant to the following levels: The monthly mean of the maximum daily temperatures shall not be raised more than 4°F during the fall, winter and spring (October through May), or 1.5°F during summer (June through September). On the basis of existing data this means that existing discharges shall not exceed 90°F at any time.

7. The Florida Power & Light Company shall not discharge waters in such velocity and in such amounts or at such points so as to change the hydrology of the receiving waters to the detriment of indigenous biota.

8. The Florida Power & Light Company shall report to the conferees not later than 60 days from today on its proposal to meet the requirements specified above.

9. The conference may be reconvened by the chairman after consultation with the conferees, or the chairman after such consultation may call a progress meeting.

This concludes the conclusions and recommendations. Does any of the conferees have a statement that he wishes to make?

MR. REED: Yes.

MR. STEIN: Mr. Reed.

MR. REED: My statement is short, Mr. Chairman. It is directed to all of us, I think, in the room as we stumble from the Dark Ages of Environmental Concern and Planning. It is now apparent that the regulatory agencies are carrying an unfair burden. Responsibility for forecasting environmental conflicts may be easier than attempting to solve the present brinkmanship. Dade County would be well advised, as would all the counties in Florida to rapidly develop a mechanism of forecasting environmental problems.

Desperately needed is an environmental council to advise the decisionmakers and for the public before, not after the problem raises its head.

That's it.

Closing Statement - Murray Stein

MR. STEIN: Thank you, Mr. Reed.

After an eloquent statement like that, I think nothing has to be added. But I would just like to make one point on the process here. I know that you have seen the rough edges of State-Federal and local industry -- and I use this word with not too much of a grain of salt -- "cooperation." There are different pulls. The funny thing is that under our system this works, and I have been involved with some 1800 cities, and a like amount of industries throughout the country -- big and small.

Whatever the differences we have in philosophy, it is my opinion if men of good will put their minds to it, we can come up with a solution which will be agreeable to all and will preserve the environment. With that, I hope that you understand and have followed this process. I want to thank you people who stayed with us all the way through. You have indeed been loyal. I think you have been exposed to the whole business in both the public and Executive Session. We appreciate your participation and your contributions.

We stand adjourned.

(Whereupon, the conference was adjourned at 11:30 a.m.)

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Conference - Thermal Pollution of
Biscayne Bay National Monument
Department Interior FWPCA
State of Florida

February 25, 1970
Miami, Florida

STATEMENT

of Anti-Pollution League, Allendale, N. J.

by

Larry Bogart, Executive Director

My name is Larry Bogart. I am executive director of The Anti-Pollution League, a national citizens and scientists group headquartered in Allendale, N. J. which for the last three and a half years has made studies and conducted educational programs on effects of nuclear activities on the environment. Recently, the League under the leadership of the National Parks Association joined with 20 conservation groups in a successful move to protect the Everglades from the jetport.

We appreciate being able to make statement at this momentous conference. As a result of your deliberations, we may be spared the fearful impact of 121 large nuclear reactors now building or proposed on America's great rivers, bays and lakes -- in spite of the $12 billion already committed by utilities in this rash nuclear adventure.

We commend the State of Florida and the Department of The Interior for this timely action.

Statement, Anti-Pollution League, Miami Conference
February 25, 1970

The wealth of data on the effects of heat loading of estuarine waters developed by the FWPCA is invaluable to a consideration of what must be done to prevent serious damage to the delicate ecosystems in south Florida waters. It must, however, be placed in context. Everytime we fractionate our approach to the environment, we invite error or distortion. We must step back and see the interactions and complex relationships in natural systems, if we are to safeguard fully this priceless National Monument. Unfortunately, a single government agency with the wide overview needed has not yet been created, but we have advanced to the realization that the AEC is ill-suited for this role and can no longer be permitted to be both promoter and regulator of nuclear power.

This week in Washington the Joint Committee on Atomic Energy is holding their fourth in a series of hearings on Nuclear Power and Environment. Biologists and independent scientists are issuing warnings which confirm the League's position that nuclear power's environmental costs, as well as the financial ones, are too high for any broad use of this incomplete technology, and we had better start backing up before we are boxed in with spiralling costs for nuclear power and an acute shortage, plus a sickening environment.

The last year has shown that the promotional job the AEC has done is superb, ranking with the South Sea Bubble and the Florida land boom of the 20s, but actual performance is lacking. All earlier claimed benefits have disappeared.

The problem the conference is pondering stems from a decision made in 1962 to go full speed ahead with a type of reactor -- the light-water design -- which Dr. David R. Inglis, for many years with Argonne National Laboratory in reactor development, now Professor of Physics at the University of Mass., Amherst, believes never should have gone beyond the demonstration plant stage. Certainly it should never have been certified to utilities, which have rather blindly bought braces of them, totally untried giant-sized reactors now going up on the outskirts of our metropolitan centers.

Even the Atomic Energy Commissions's Safety & Licensing Board, hearing testimony opposing a Construction License for Indian Point No. 3 on the Hudson last April, could not rule out the combined effects of radioactive wastes in heated effluent on biota. The literature is abundant on how heat is the most pervasive factor upsetting the stability of aquatic and marine organisms. The basic design of all light-water reactors requires that routinely they release quantities of low-level radioactive wastes to the air and water at the reactor site. While this is supposed to be governed by Guidelines limiting the concentrations of reactor fission products, these standards have come under increasing questioning. Physicians and biophysicists are convinced that allowable limits should immediately be revised downward ten-or 100-fold because of the well-known relationship between excessive radioactivity and leukemia and other cancers. Others hold that a reactor design which voids any waste at all should be sent back to the drawing board. There is no such thing as a safe level of radiation. It is doubtful that Turkey Point No. 3 and No. 4 could meet the restrictive standards for waste discharge that are bound to come. Besides, they require about 50 percent more cooling water than conventional plants of the same size.

Statement, Anti-Pollution League, Miami Conference

February 25, 1970

Serious as the effects of thermal loading may be, they are put in the shade by the catalogue of somatic and genetic effects of radioactivity on living organisms, including man. The effects of tritium, H_3, a fission product which cannot be filtered out of reactor effluent streams, are being dabated but could be so serious as to warrant a moratorium on nuclear plant construction. Tritium is an inevitable radioactive pollutant in condenser cooling water used to dilute low-level waste; its biological uptake may be more rapid in warmer southern waters.

In addition, light-water reactors may cause greater ecological disturbances than Turkey Point No. 1 and No. 2 because they are shut down for weeks during the refueling operation and from time to time by unscheduled outages. When this happens during the winter, the abrupt drop in temperature may be more damaging to organisms than sudden heat increase.

The plain truth is that we do not know a great deal about the effects of heat on the webs of estuarine life, or the effects of low-level radioactive wastes of a dozen different isotopes, because there is absolutely no operating experience anywhere with reactors the size of Turkey Point No. 3 and No. 4.

In the words of Dr. LaMont C. Cole, distinguished professor of ecology at Cornell University, these light-water reactors are primitive and obsolete. They are a national liability because they waste all but a fraction of one percent of the scarce Uranium-235 loaded in the core. Quantities of low-grade waste heat is one of the results. Finally, this type of reactor accumulates billions of curies of deadly high-level wastes between refuleing. This spent fuel is transported to reprocessing facilities, which are particularly polluting. The resulting boiling hot waste must be kept in perpetual care. Even if all reactors were required to be deep underground as a primary protection against release of high level fission products by accident or sabotage, there is no surety that this deadly waste can be totally contained. Even a minor malfunction could become our most costly industrial accident and render the national Monument unuseable for decades.

Statement, Anti-Pollution League, Miami Conference

February 25, 1970

When we can generate power most economically and with complete safety from abundant fossil fuels and transmit it over long distances without significant loss, why should we further experiment with what Supreme Courts Justices Black and Douglas called the most awesome, the most deadly process invented by man, in an area where we should for all time enjoy a National Recreational Preserve? There are two tasks for technology: clean up fossil fuel combustion and pioneer new ways to obtain pollution-free energy.

WERNER N. GRUNE
CONSULTING ENGINEER

March 23, 1970

1219 Manati Avenue
Coral Gables, Florida 33134

Mr. Murray Stein
Assistant Commissioner
Enforcement Division
Federal Water Pollution Control Administration
U.S. Department of the Interior
Washington, D.C. 20242

Re: Turkey Point, February 24-26, 1970 Conference

Dear Mr. Stein:

Following my move to the University of Miami last fall, I have finally regained secretarial assistance and transcribed from my notes the testimony given at the FWPCA-Florida Division of Natural Resources joint conference on February 25 and 26, 1970.

I am enclosing a copy of this typed transcript because my delivery from these notes was undoubtedly imperfect and incoherent to some extent. When I arrived at the Four Ambassadors Hotel on Tuesday, the beginning of these hearings, Mr. Carl Klein had just returned from his helicopter tour of Card Sound and I had not even remotely considered to testify as a "neophyte" in this South Florida location.

You are aware of what followed, except that I had to maintain my regular classroom teaching duties and gear up graduate assistants for an environmental monitoring study on the jetport while trying to attend your meetings downtown. Thus, my notes had to be composed while listening to the hearings and for this reason they were rearranged afterwards in a more coherent manner.

Since the close of your hearings I have been in touch with Lakeside Engineering to explore the applicability of the "Kessener" brush concept to artificially induce turbulence for heat dissipation in the 210-ft. wide discharge canal to Card Sound. The new Magna Rotor design can be extended to a 30-ft. shaft and perhaps larger. Such a unit would require about 25-30 hp. Similar devices, of the floating doughnut design, may have an even greater ability to dissipate heat. Installation of such a device in the discharge canal may provide a temporary solution (and not hamper FP&L construction progress) while other, permanent solutions can be explored in greater depth.

Mr. Murray Stein — March 23, 1970

I have written to Dr. Arnold Joseph today and also enclosed a copy of the testimony-transcript to him.

With best personal regards.

Cordially yours,

Werner N. Grune
Professor and Director of
Sanitary Engineering Research

WNG:pjg
Enclosure

TESTIMONY GIVEN BEFORE FWPCA - STATE OF FLORIDA ENFORCEMENT CONFERENCE

Presented at 4:45 PM EST
February 25, 1970
Sheraton Four Ambassadors
Miami, Florida

Mr. Chairman, Conferees and Attendees:

I am a professional sanitary engineer. I have a (a) BS in Engineering, University of Connecticutt; (b) MS in Sanitary Engineering, Harvard University; (c) Dr. Engineering Science in Nuclear and Sanitary Engineering, New York University; (d) am a Diplomate of American Academy of Environmental Engineers; and (e) am a Registered Professional Engineer in the States of New York, Massachusetts and Georgia.

I have been associated with water pollution control since serving with the U.S. Government under P.L. 845 some twenty years ago.

My professional background includes:

1) Assistant Professor - New York University (also: Nuclear Waste Disposal Research.)

2) Associate Professor and Professor - Georgia Tech.
   Director of Sanitary Engineering Research
   Research on Nuclear Waste Disposal and Automation of Waste Treatment Plants.

3) Consultant to U.S. Air Force, Corps of Engineers, United States Atomic Energy Commission, United States Public Health Service and various industries.

4) Presently: University of Miami, School of Engineering and Center of Urban Studies.

5) Work done specifically cogent to this problem: Impact of future siting of nuclear power plants (Commonwealth Edison) - approximately 10,000 Mw(e) on the Great Lakes (Lake Michigan).

Let's keep some semblance of reason whether scientists, engineers or conservationists; federal, state, or local public officials - I plead for some sanity in this case.

Let's look at these costs:

> An ocean outfall estimated variously to cost from \$110 to \$125 million or 10% of total plant investment at Turkey Point (FP&L Company). This means that a 12-mile outfall would cost approximately \$2,000 per foot.

Obviously, private industry cannot be asked to go this alone - it would be a financial fiasco. On the other hand, we have data showing steadily increasing biological insult to Cutler Bay - a progressive degradation of the aquatic flora and fauna of the area. These data are backed up by aerial photographs from 1938 to 1969, showing clearly the continuously increasing denudation of the Cutler area from 1956 to present, as measured, among others by such parameters as: Plant standing crop, Sediment particle size analysis, and Invertebrate animal species Diversity Index. And this effect is documented for a plant of only 348 megawatts

$$\left(\frac{348}{2,384}\right) \times 100 = 14.8\%$$ or less than 15% of the 2,384 Mw(e)

power output when nuclear power units 3 and 4 are installed and become operational at Turkey Point.

Therefore with proper respect to all those present and their many deliberations, studies, reports, and timeless efforts, and yet to prevent the evenual destruction of the ecology of Biscayne Bay at a four-fold increase of the present heat input rate, I wish to propose the following:

1. Revised Cost of Ocean Outfall

A revised cost study of the outfall to the Gulfstream where 4,250 cfs will be promptly diluted and mixed. This outfall has been variously reported of 8 mi., 11, and 13 mi. length with a dual system of pipes of 15-ft. and 17-ft. diameter. Actually, simple engineering calculations show that a dual 15-ft. system would produce an average velocity of 12 ft/sec, a velocity range which would give way to prohibitive cavitational problems. A dual system of 20-ft. diameter pipes would produce an average velocity of 6.81 fps. Nevertheless, I submit that such a system can be engineered for \$60 million - one-half the price tag that has been discussed, or about \$1,000/lineal foot, considering difficulty of construction.

This cost should include location, dredging, pipe, construction of pipeline and booster pump station. Dredging is a major cost but I suspect there may be help from Uncle Sam. And why not get help from Uncle Sam to accomplish the task? This region needs power - it also represents one of the favorite playgrounds of the Nation and we must preserve these vanishing frontiers as man puts on his aqualungs to enjoy increased leisure time. As a former Corps officer and recently engaged in dredging operations of the Great Lakes, I know the enormous dredging capability of the U.S. Army Corps of Engineers. They have done wonders with deepening the Delaware River Channel to the great port of Philadelphia, Moriches Bay in Long Island, New York, and the Corps is continuously dredging to keep the shipping lanes open in our Great Lakes. And this is done in the face of solving problems from pollution. And while we are talking about Uncle Sam - the Federal Water Pollution Control Administration would be glad to see the morningglory spillway, or "rosebowl", near Norris Cut emanating from the greatly overloaded 48 mgd modified activated sludge plant at Virginia Key, disappear.

2. Multiple Effect Humidity Process

Funds of $150,000 of the Office of Saline Water, U.S. Department of Interior, were poured into this research from 1957 to 1962 and ultimately a 260,000 gpd Pilot Plant was built at Puerto Penasco, Sonora, Mexoco. Actually, this process is available license-- free from the U.S. Government and in addition to providing excellent quality feedwater it represents a closed "wet" cooling system (direct contact with air) and thus poses no problem due to drift.

It should be emphasized that this work was undertaken to convert sea water, but the heat transfer aspects that are of interest are germaine to this problem. I have not been asked, commissioned or requested to undertake detailed studies - therefore have no final cost estimates of a full-scale plant. This work has not been published - actually I will present it for the first time publically in September of this year at Dubrovnik, Yugoslavia at the 3rd International Congress of Saline Conversion.

As a final note, I would like to call your attention to an "ongoing" study of heated effluents in several long, rectangular channels, each held at a constant temperature ranging from 60°F to 100°F (approximately), conducted on the outskirts of Munich, Germany. This work is under the direction of Dr. Hans Liebmann of the University of Munich, conducted for the Department of Agriculture of the Republic of West Germany. I had an opportunity to see and discuss early plans of this investigation (conducted actually for EURATOM to examine the influence of heated effluents in the much smaller streams of Germany and Western Europe) while lecturing at the University of Munich in the summer of 1968. I believe that current information from these investigations may be valuable in assessing the value of the open channel canal proposed by Florida Power and Light.

GRUNE, Werner Norbert

Rank: Professor and Chairman, Department of Civil Engineering, Merrimack College, North Andover, Massachusetts

Education:

(1) Civil Engineering: Technische Hochschule, Cologne, Germany 1938

(2) B.S. in Engineering (Major: Civil Engineering), The University of Connecticut, Storrs, Connecticut 1944

(3) A.S.T.P. Term 9-A, Graduate Studies in Sanitary Engineering, The Ohio State University, Columbus, Ohio 1945

(4) M.S. in Sanitary Engineering (also graduate work in Soil Mechanics), Harvard University, Cambridge, Mass. 1948

(5) Dr. Engr. Sc. (graduate work in Civil and Sanitary Engineering, Statistics, Radiochemistry and Nuclear Engineering) New York University, New York, New York 1951

Experience:

(1) Structural draftsman, detailer and designer on industrial buildings and bridges 1939-44

(2) U.S. Army Officer. In responsible charge of water supply including construction, equipment supply and operation in European Theatre of Operations, Office, Chief of Engineers, U.S. Army 1945-47

(3) Lecturer in Sanitary Engineering, C.E. Dept., School of Engineering, New York University, New York 53, New York 1948-49

(4) Research Associate and later Project Director, Waste Disposal Research for U.S.A.E.C. In charge of design of laboratory; design of experiments; analysis of data; progress reports 1948-51

(5) Summer work; General Engineer, E.R.D.L., Special Projects Branch, Ft. Belvoir, Va. Work involved Corps of Engrs. Mission on A.F.S.W.P. tests for fall 1951 1951

(6) Sanitary Engineer; Division of Water Pollution Control, U.S. Public Health Service Stream pollution investigations; preparation of comprehensive reports on basin-wide status of stream pollution abatement in cooperation with the respective states and other interstate and federal agencies. 1951-52

GRUNE, Werner Norbert

Experience: continued

(7)	Associate Professor of Civil Engineering, School of Civil Engineering, Georgia Institute of Technology, Atlanta, Georgia	1952-59
(8)	Sanitary Engineer, Hq. USAREUR, Com. Z., Orleans, France and Engineer Adviser, Hq. USAFE, Wiesbaden, Germany. Worked on the solution of water supply, water conditioning, drainage, sewage and industrial waste problems. (On one year's leave of absence from Georgia Tech)	1954-55
(9)	Professor of Civil (Sanitary) Engineering, School of Civil Engineering, Georgia Institute of Technology, Atlanta 13, Georgia	1959-63
(10)	Visiting Professor of Sanitary Engineering, Technische Hochschule, Karlsruhe, Germany Universities of Karlsruhe and Munich, Germany	Summer 1963 & Summer 1965 Summer 1968
(11)	Professor and Chairman, Dept. of Civil Engineering, Merrimack College, North Andover, Massachusetts	1963 - present
(12)	Research Participant, Oak Ridge National Laboratory (Eutrophication Studies)	Summer 1966 & Summer 1967

Professional Societies and Membership:

(1) American Society of Civil Engineers, Member
(2) American Water Works Association, Member
(3) New England Water Works Association, Member
(4) Water Pollution Control Federation (New York and Georgia)
(5) Harvard Engineering Society
(6) Harvard Public Health Association
(7) Who's Who in Engineering (7th Ed.)
(8) Diplomate, American Academy of Environmental Engineers
(9) Society of American Military Engineers
(10) Registered Professional Engineer (New York and Georgia)
(11) Georgia Academy of Science
(12) Society of the Sigma Xi
(13) American Society for Engineering Education
(14) Georgia Education Association
(15) Health Physics Society
(16) American Public Works Association

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1. "Treatment of Wool Scouring Wastes by Calcium Hypochlorite", Unpublished Master's Thesis, Harvard University, June 1948
2. "Counter Instrumentation and Measurement of Radioactivity", Progress Report to U.S.A.E.C., NYU-2 (February 1949)
3. "Biochemical Oxygen Demand of Sewage and Standardization of Laboratory Procedures", Progress Report to U.S.A.E.C., NYU-3, NYOO-1500 (September 1949)
4. "Calculation and Statistical Analysis of the Biochemical Oxygen Demand Velocity Constant", Progress Report to U.S.A.E.C., NYU-4, NYOO-1501 (November 1949)
5. "Biochemical Oxygen Demands of Radioactive Sewage (I)", Progress Report to U.S.A.E.C., NYU-6, NYOO-1510 (March 1950)
6. "Design of a Radiological Laboratory", Progress Report to U.S.A.E.C., NYU-5, NYOO-1516 (May 1950)
7. "Design of a Radiological Laboratory of Sanitary Engineering Research", Modern Sanitation, 2, 22 (May 1950)
8. "Studies on the Effect of Radiophosphorus (P^{32}) on the Biochemical Oxidation of Sewage", Sewage and Industrial Wastes Journal, 23, 141-153 (February 1951)
9. "Report on the Counting of Radioactive Sewage in Connection with B.O.D. Determinations", Progress Report to U.S.A.E.C., NYU-7, NYOO-1540 (February 1951)
10. "Experimental Break-Point Chlorination and Anti-Corrosion Control at Maynard, Massachusetts", Journal, New England Water Works Assn., 65, 1, 17-70 (March 1951)
11. "Redesign of a Sanitary Engineering Laboratory to Permit the Use of Radioisotopes", NYO-1553, U.S. Atomic Energy Commission, Technical Information Service, Oak Ridge, Tennessee (March 1951)
12. "Redesign of a Sanitary Engineering Laboratory to Permit the Use of Radioisotopes", Nucleonics, 9, 2, 59-64 (August 1951)
13. "Effect of Radioactivity on the Biochemical Oxidation of Domestic Sewage", Final Report to U.S.A.E.C., NYU-8, NYOO-1567 (October 1951)

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Publications: continued

14. "Radioactive Effects on the B.O.D. of Sewage", *Sewage and Industrial Wastes Journal*, *25*, 8, 882-897 (August 1953)

15. "Biocatalysts in Sludge Digestion", *Sewage and Industrial Wastes*, *26*, 12, 1425-1442 (1954)

16. "Effects of Fluoride Concentration on Sludge Digestion", *Sewage and Industrial Wastes*, *27*, 1, 1-3 (1955)

17. "Sewage Chlorination in Review", *Water and Sewage Works*, *102*, 350-357 (August 1955)

18. "Development of a Continuous Gas Chromatographic Analyzer for Sludge Digestion Studies", *Sewage and Industrial Wastes*, *28*, 12, 1433 (December 1956)

19. "Redox Potentials in Sludge Digestion", Presented at Southwide Chemical Conference, Memphis, Tennessee, December 6-8, 1956. *Water and Sewage Works*, *105*, 1, 37 (1958).

20. "Applications of O.R.P., Conductivity and Gas Chromatography on Sludge Digestion", Presented at *2nd Bio-Oxidation Conference*, Manhattan College, New York, N.Y., *April 25, 1957*, "Biological Treatment of Sewage and Industrail Wastes", Vol. II, Chapter 1-8 p. 80-96, Rheinhold Publishing Company, New York, N.Y. 1958

21. "Anaerobic Process Automation by ORP, Conductivity and Gas Chromatography", Presented at *12th Industrial Waste Conference*, Purdue University, Lafayette, Indiana, May 14, 1957, *Proceedings* pp. 604-635 (May 1958)

22. "Waste Treatment at a Quartermaster Laundry in France", *Industrial Wastes*, *3*, 112 (1958)

23. "Redox Potential in Waste Treatment - Laboratory Experiences and Applications", Presented at 29th Annual Conference Pennsylvania Sewage and Industrial Waste Association, August 28-30, 1957, *Sewage and Industrial Wastes*, *30*, 479 (April 1958)

24. "New Parameters for Improving Control of Sludge Digestion - Part I: Chromatographic Analysis of Gas, Part I: Electrical Conductivity Readings Trace Total and Dissolved Solids and Part III: Oxidation-Reduction Potentials for Checking Digester Activity", *Wastes Engineering*, *29*, 354, 425 and 468 (1958)

25. "Effects of Radioactive Material on Anaerobic Digestion - Part I: Radiophosphorus and Part II: Radioiodine", *Sewage and Industrial Wastes*, *30*, 1123 and 1399 (1958)

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Publications: continued

26. "Improved Solar Still Process for Desalting Sea and Brackish Waters", Journal, American Water Works Assn., 52, 993-1005 (August, 1960)

27. "Gas Chromatography for Waste Treatment Control", Presented at the 32nd Annual Meeting, Federation of Sewage and Industrial Wastes Association, Dallas, Texas, Oct. 13, 1959, Journal, Water Pollution Control Federation, 32, 942-948 (September 1960)

28. "Application of Gas Chromatography to Sludge Digestion Gas Analysis", Water and Sewage Works, 107, 10, 396-399 (October 1960)

29. "Methods for Determining Radon-222, Radium-226 and Lead-210 in Water", Journal, American Water Works Assn., 53, 63 (January 1961)

30. "Natural Radioactivity in Ground Water Supplies in Maine and New Hampshire", Journal, American Water Works Assn., 53, 75 (January 1961)

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"Radioactivity and Digestion - New Problem of the Atomic Era" Part II) Wastes Engineering, 32, 82 (February 1961)

32. "New Applications of Thermodynamic Principles to Solar Distillation", Presented at the Summer Annual Meeting, A.S.M.E., Los Angeles, California, June 11-15, 1961, A.S.M.E. Paper No. 61-SA-45

33. "Operating Experiences with Natural and Forced Convection Solar Stills", Water and Sewage Works, 108, 387 (1961)

34. "Forced Convection Multiple Effect Solar Still for Desalting Sea and Brackish Water", Presented at the United Nations Conference on New Sources of Energy, Rome, Italy, Conference Paper 35/S/14 (August 1961)

35. "The New Profile of Research: Sanitary Engineering - 1961", Wastes Engineering, 32, 407 (August 1961)

36. "Natural Radioactivity in Ground Water - Parts 1 and 2", Water and Sewage Works, 108, 410 and 449 (November and December 1961)

37 "Determination of Low-Level Radioactivity in Water", Water and Sewage Works, 108, 472 (December 1961)

GRUNE, Werner Norbert

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38. "Natural Radioactivity in Ground Water - Part 3", Water and Sewage Works, 109, 25 (January 1962)

39. "Natural and Forced Convection Solar Stills", Journal, Sanitary Engineering Division, A.S.C.E., 88, SA1, 1 (January 1962)

40. "Performance of Forced Convection Solar Stills", Presented at the Solar Energy Symposium, University of Florida, Gainesville, Florida (March 5-6, 1962)

41. "Analysis by Gas Chromatography - Part 1 and 2", Industrial Water and Wastes, 7, 29 and 72 (1962)

42. "The Effects of C-14 and Sr-90 on Anaerobic Digestion", Presented at the Ninth Industrial Waste Conference, Ontario, Canada, June 24-27, 1962, Proceedings, Ninth Ontario Industrial Wastes Conference, p. 125; Journal, Water Pollution Control Federation, 34, 493 (1963)

43. "Application of Gas Chromatography to Sludge Digestion Gas Analysis", Int. J. Air and Wat. Poll., 6, 283 (1962)

44. "Analysis of Oxides of Sulfur and Nitrogen by Gas Chromatography", Presented at the Division of Water and Waste Chemistry, 142nd National Meeting of the American Chemical Society, Atlantic City, New Jersey, September 10-14, 1962

45. "Sludge Gas Analysis Using Gas Chromatography - Part 1", Water and Sewage Works, 109, 468 (1962)

46. "Sludge Gas Analysis Using Gas Chromatography - Parts 2 through 8" Water and Sewage Works, 110, 43, 77, 102, 127, 171, 220, and 254 (1963)

47. "Determination of Low-Level Radioactivity in Water - Parts 1 through 4", Water and Sewage Works, 110, 34, 69, 97 and 143 (1963)

48. "Development of a Rapid Assay Method for Gross Low-Level Radioactivity in Water", Presented at the Annual Meeting of the Commission on Environmental Hygiene of the Armed Forces Epidemiological Board, Washington, D.C., (March 4, 1963)

49. "Saline Water Conversion by the Multiple Effect Humidity Process", Presented at the Solar Energy Symposium, University of Florida, Gainesville, Florida, April 1-2, 1963

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GRUNE, Werner Norbert

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50. "Feasibility Studies for the Establishment of Parameters for Background Radiation Measurements", Presented at the International Symposium on "The Natural Radiation Environment" William Marsh Rice University, Houston, Texas, April 11-13, 1963. "The Natural Radiation Environment", Part II, Chapter 40, pp. 661-686, The University of Chicago Press, Chicago, Ill., 1964.

51. "Effects of High Energy Ionizing Radiation on Colloidal Systems and Suspensions", Presented at the Contractors' Meeting, Division of Isotopes Development, U. S. Atomic Energy Commission, Brookhaven National Laboratory, Upton, Long Island, New York, April 22-23, 1963.

52. "Water Treatment Research at Georgia Tech", Water Works Engineering, 116, 356 (May 1963).

53. "By-Product Recovery of Atomic Energy Wastes to Treat Colloidal Systems and Suspensions", Presented at the Tenth Industrial Waste Conference, Honey Harbor, Ontario, Canada, June 23-26, 1963. Proceedings, Tenth Ontario Industrial Wastes Conference (1963).

54. "Studies of Background Radiation Parameters", Presented at the 14th Oklahoma Industrial Wastes Conference, Oklahoma State University, Stillwater, Oklahoma, November 20-21, 1963.

55. Annual Review of the Literature of 1963 on Wastewater and Water Pollution Control, "Estuarine & Marine Pollution", Journal, WPCF, 36, 7, 853-863 (July 1964).

56. "Automation of Sludge Digester Operation", Presented at the 37th Annual Meeting, Water Pollution Control Federation, Bal Harbour, Florida, September 27-October 1, 1964, Journal, Water Pollution Control Federation, 37, 353-380 (March 1965).

57. Annual Review of the Literature of 1964 on Wastewater and Water Pollution Control, "Estuarine & Marine Pollution", Journal, WPCF, 37, 7, 962-975 (July 1965).

58. "Investigation of the Effects of High Energy Ionizing Radiation on Colloidal Systems and Suspensions", Presented at the Symposium on Recent Advances in Sewage Treatment, 148th National Meeting of the American Chemical Society, Chicago, Illinois, August 30-September 4, 1964, Water and Sewage Works, 112, 262 (July 1965).

59. "Report Relative to the Water Shortage and Industrial Water Use and Reuse", Legislative Research Council, The Commonwealth of Massachusetts, Senate No. 930 (April 27, 1966).

60. Annual Review of the Literature of 1965 on Wastewater and Water Pollution Control, "Estuarine & Marine Pollution", Journal, WPCF, 38, 7, 1117-1128 (July 1966).

GRUNE, Werner Norbert

Publications: continued

61. Annual Review of the Literature of 1966 on Wastewater and Water Pollution Control, "Cyanide and Plating Wastes", Journal, WPCF, 39, 6, 887-889 (June 1967).

62. WPCF Manual of Practice No. 16, "Anaerobic Sludge Digestion" (member of subcommittee), WPCF (1968).

63. Annual Review of the Literature of 1967 on Wastewater and Water Pollution Control, "Cyanide and Plating Wastes", Journal, WPCF, 40, 6, 1180-1198 (June 1968).

64. Annual Review of the Literature of 1968 on Wastewater and Water Pollution Control, "Cyanide and Plating Wastes", Journal, WPCF, 41, 6, 1203-1221 (June 1969).

65. "Electrode Potential Control of Ocean Outfalls", presented at the ASCE Specialty Conference on 'Environmental Engineering for the Ocean and the Continental Shelf", Miami Beach, Florida, December 10-12, 1969

P
CR
B

PERRINE-CUTLER RIDGE BANK
PERRINE, FLORIDA 33157

L. RUSSELL NORTON
VICE PRESIDENT
COMMUNITY RELATIONS

February 23, 1970

Mr. Murray Stein, Chairman
The Federal-State Conference on Water Pollution
The Four Ambassadors
801 South Bayshore Drive
Miami, Florida

Dear Mr. Stein:

This will register my concern with pollution and any future pollution in Dade County, and in particular, Biscayne Bay.

The voluminous information brought forth in recent months through the media, various seminars and conferences, accelerate a layman's concern in "hot" water cooling canals and various other primitive means discussed recently.

I place complete faith in your Conference in committing the future of the ecology of Biscayne Bay.

Sincerely,

L. RUSSELL NORTON

LRN:gev

895

GULF COAST RESEARCH LABORATORY
P. O. DRAWER AG
OCEAN SPRINGS, MISSISSIPPI 39564

INSTITUTIONS OF HIGHER LEARNING
STATE OF MISSISSIPPI

THE DIRECTOR'S ROOM

11 March 1970

Mr. Murray Stein
Federal Water Pollution Control Administration
Washington, D. C.

Dear Mr. Stein:

Enclosed are some remarks that I have made in rebuttal, chiefly to the remarks of Dr. Gilbert Voss. I might call your attention briefly to the fact that if Voss' peculiar statements were true the man who would really be excluded from giving expert testimony on marine estuarine temperatures would be Dr. Clarence Tarzwell; but, of course, his remarks are very much incorrect.

Sincerely,

G. Gunter

Gordon Gunter

GG/swb

Remarks Concerning the Federal Conference on Biscayne Bay Thermal Problem, 25 February 1970

Page 380. Mr. Thoman states that the Gulf of Mexico has a wide shelf up to fifty miles on the Mississippi Coast, which is quite different from the area out from Biscayne Bay and that is quite correct. But the Mississippi coast is cooled to some extent by the largest river in North America. Furthermore Biscayne Bay has the warm Gulf stream following nearby and no warm current warms the northern Gulf Coast. As we go north the average temperature gradually declines and most of the northern Gulf Coast is in a cooler area.

What has happened is that northern biologists working in colder waters are attempting to set temperature standards that are simply unrealistic when applied to the South.

For instance, during a survey of the fauna of Mississippi Sound which has been conducted from 1966 to 1969, inclusive, it has been found that the open sound during the months of June, July and August the temperatures have ranged above 32.2° C. (90° F) 7 per cent of the time. Furthermore, I would like to point out that a number of fishes and invertebrates found in Mississippi Sound are also found in Biscayne Bay.

The remarks of Dr. Gilbert Voss from page 483 are rather peculiar. He starts off by saying that Dr. Charles Wurtz and I questioned the Hoover Report while under oath. That is, of course, correct. The chief error in the Hoover Report is the implication that 90° F. constitutes a breaking point and that anything above that point would be very harmful to marine animals. If such were the case this fact would be very well known and one of the major pieces of information in marine zoology. Reiteration of the same error over and over does not make the case true, no matter how strident Voss' personal attacks on the questioners.

Then Doctor Voss impugns my experience in tropical marine biology, which he emphasizes. One would think that the separation of the Gulf of Mexico and the other northern bays is so great from Biscayne Bay that no information could apply from one to the other. The fact of the matter is that the principles of physiology and ecological temperature relationships are much the same.

Doctor Voss has worked mostly as a high seas biologist and actually has published very little in the estuarine area. On the other hand I have never collected a piece of data more distant than five miles offshore, except very recently. Doctor Voss has never written a paper concerning temperature so far as I know and I have always accepted him as a specialist in taxonomy of the high seas, decapod mollusks.

In fact I am rather startled at his personal attack which followed simply because I questioned a conclusion. Part of his statement was that I have had no experience in tropical biology. The fact of the matter is I have had a great deal more experience in tropical and sub-tropical estuaries than Voss has had. Most of my work in Texas was done in Copano and Aransas bays and the offshore Gulf, which lies in the same latitude as Tampa. Furthermore, I worked in the Laguna Madre which extends as far south as the Ten Thousand Islands. I have worked in Tampa Bay, Charlotte Harbor and even the Whitewater Bay in the Everglades. I was working in Biscayne Bay in 1946, which is six years before Doctor Voss got his bachelor's degree. I have also worked in Laguna de Tamiaua, far below the Tropic of Cancer, for the University of Mexico. I have published papers on the Caloosahatchee River (estuary) and the St. Lucie Estuary. In fact, I am generally recognized as a estuarine biologist and, if I were to exclude Doctor Voss's authority on those grounds I would have more reason for doing so than he does me in terms of "tropical" temperature.

As a matter of fact the principles are very much the same in the marine sciences and Doctor Voss's remarks in this respect show a great pomposity and they are completely without merit. His statement that he submitted the finest proposal ever turned in for the study of a bay and which was turned down, is rather sad. Doctor Voss appears to feel he has some proprietory right to Biscayne Bay and should not be questioned. The fact of the matter is that he has not had much experience in estuaries.

And if it were true that a person who had not been broadly acquainted with tropical estuaries could not rule on the water temperature of Biscayne Bay, where would that put Dr. Clarence Tarzwell, who has worked only on the freshwaters of the northern climes.

Gordon Gunter

Gordon Gunter
11 March 1970

As a supplement to my statement concerning the inexperience of Dr. Gilbert Voss in estuaries I should like to cite the following volume which is the most recent and most authoritative publication on this subject: Estuaries, G. H. Lauff, Ed. Publication No. 83, American Association for the Advancement of Science, pp. xv + 757. 1967. Washington, D. C.

Listed below are the chapter headings, the pages, the authors and the numbers of times my papers were cited:

Salinity neasurements in estuaries. p. 71-79. Paul C. Mangelsdorf, 1 time.

The microbiota of estuaries and their roles, p. 291-302. James B. Lackey, 2 times.

Ecological aspects of the Laguna Madre, a hypersaline estuary, p. 408-419. J. W. Hedgpeth, 4 times.

Ecology of estuarine benthic invertebrates: a perspective, pp. 442-487. M. R. Carriker, 3 times.

Physiology of estuarine organisms with special reference to salinity and temperature: General aspects. pp. 525-540. Otto Kinne, 1 time.

Estuarine nekton. pp. 581-620, J. L. McHugh, 7 times

The role of man in estuarine processes. pp. 667-689, 8 times.

Technical approaches toward evaluating estuarine pollution problems pp. 693 - 700, A. F. Bartsch, R. J. Callaway, R. A. Wagner and C. E. Woelke, 1 time.

Supplemental bibliography, pp. 713-723, 3 times.

The total figure shows that leaving off my own chapter my papers were cited thirty times by eight different authors. Doctor Voss' name was cited once in the following: Biological zonation related to groundwater discharge along the shore of Biscayne Bay, Miami, Florida, pp. 488 - 499. F. A. Kohout and M. C. Kolipinski. (G. L. Voss and ". A. Voss.)

In the following publication, which remains the most authoritative on this subject, Treatise on Marine Ecology and Paleoecology, Vol. 1, Ecology, J. W. Hedgpeth Ed. Geological Society of America Memoir 67, pp. viii 1296. Waverly Press, Baltimore, there are forty-five index references under my name and none to Doctor Voss. Of course, Doctor Voss did not get his bachelor's degree until 1951 and his doctorate only in 1955.

He had not had the time to acquire much of a reputation in marine ecology or estuarine biology. He still has not acquired these reputations, except in his own estimation.

G. Gunter

Gordon Gunter
13 March 1970

901

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WASHINGTON, D. C. 20006
TELEPHONE: 202-638-3752

Washington, D. C.
March 13, 1970

Mr. Murray Stein
Federal Water Pollution Control Administration
1921 Jefferson Davis Highway
Arlington, Virginia

Dear Mr. Stein:

On behalf of Florida Power & Light Company, I am enclosing, for inclusion in the record of the Federal-State Conference held in Miami, Florida on February 24-26, 1970, the professional resumes of the five Board Members of the Dade County Pollution Control Hearing Board.

Yours very truly,

Richard M. Merriman
/Richard M. Merriman

RMM*C
Encl.

Thomas P. Hughes.

Born - May 19, 1900 in Sonora, California.

Education:
- B.A. in chemistry, Stanford University, 1921
- M.A. in chemistry, Stanford University, 1922
- Ph. D., Harvard University, in bacteriology, 1926
- M.P.H., Johns Hopkins University, Epidemiology, 1950.

Experience:
- Assistant in Instruction, Biochemistry, Stanford, 1921-22
- Instructor in Biochemistry, University of Illinois School of Medicine, 1922 - 1924
- Teaching Fellow in Bacteriology, Harvard University Medical School, 1924-1926
- Assistant (1926-1928) and Associate (1928-1931) in Experimental Epidemiology, Rockefeller Institute for Medical Research, New York City.
- Member of Field Staff, International Health Division, Rockefeller Foundation, 1931-1950, with assignments in New York City; Entebbe, British East Africa and adjoining countries; Rio de Janeiro, Brazil; and Baltimore, Maryland.
- Chief, Virus Unit, Virus and Rickettsia Section, United States Public Health Service Communicable Disease Center, Montgomery, Alabama, 1950-1952.
- Director, Central Government Laboratories, Kingdom of Jordan, 1951-1952, while of leave of absence from the United States Public Health Service.
- Health Laboratory Consultant, World Health Organization, assigned to Panamá, Republica de Panãma, 1952-1956; assigned to Asuncion, Republica de Paraguay, 1956-61.

Professional Associations: Past or present member of the following:

- Society of American Bacteriologists
- American Association of American Immunologists
- American Public Health Association (Fellow)
- American Society of Tropical Medicine.
- Society for Experimental Biology and Medicine
- Royal Society of Tropical Medicine and Hygiene (Fellow) (London)
- The Harvey Society.
- American Association for the Advancement of Science (Fellow)
- Sociedad Brasiliera de Higiene Pública (Rio de Janeiro)
- Association Panameña de Salud Pública (Panamá City)

Honors and Fellowships:

- Research Fellow in Medicine, National Research Council.
- Society of Sigma Xi.
- Research Society of America

Publications: List attached.

Other information: Commission as Senior Scientist, United States Public Health Service Reserve, 1952 - 1963.

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PUBLICATIONS

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lymph following portal blockade.
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anaphylactic shock by means of portal blockade.
J. Immunol, 8, 367-376, 1923

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lymph following injection of old tuberculin in normal and tuberculous
dogs.
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iodide injections.
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Field observations on the spontaneous disease.
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further field observations of spontaneous disease.
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persons.
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Ann. Trop. Med. (Leverpool), 35, 141-148, 1941

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Am. J. Trop. Med., 30, 835-853, 1950.

PROFESSIONAL RESUME

BOBBY J. CHAPMAN, P.E.

EDUCATION:
B.S.M.E., University of Miami, 1954.
Aeronautical Engineering, Auburn University, 1936-40.

REGISTRATION:
Registered Professional Engineer,
Florida Certificate No. 7603.

MISCELLANEOUS:
Age : 52 (25 August 1917)
Citizenship : Born Ozark, Missouri.

MILITARY: Retired United States Air Force Reserve, Lt. Colonel.

PROFESSIONAL SOCIETIES: The Anerican Society of Mechanical Engineers.
The Society of Automotive Engineers.
The National Society of Professional Engineers.
The Society of American Military Engineers.
The Florida Engineering Society.
The Greater Miami Aviation Association.

CIVIC RESPONSIBILITIES: Engineer Member, Dade County Pollution Control Hearing Board.

EXPERIENCE:
1968 to Date - B.J. Chapman Associates, Inc., Consulting Engineers, Coral Gables Florida: a professional practice encompassing the mechanical and electrical engineering aspects of special purpose machinery, research and development, military systems and value engineering. Current projects include an integrated aircraft radar approach control (RAPCON) and instrument landing (ILS) system now under construction at a major Air Force Base, the design of a special facility to house a flight simulator for a new, classified military aircraft.

1967 and 1968 - Chapman & Payne, Inc., Consulting Engineers, Coral Gables, Florida: a professional practice encompassing the structural, mechanical and electrical engineering aspects of research and development, design and construction. Representative projects include design of aircraft service equipment, development of clean room and controlled enviroment systems, optimization of extremely lightweight structural components, imparting fire-resistivity to construction products, development of air-transportable military ground support equipment, value engineering and the design of industrial fabricating facilities.

1963 to 1967 - B. J. Chapman Associates, Consulting Engineers, Coral Gables, Florida: a professional practice encompassing the mechanical and electrical aspects of industrial plant design and machinery, conventional building systems, research and development, value engineering and military systems. Significant projects have been a Blast Freezer Plant for Velda Dairies; U. S. Department of Agriculture, Forest Range Laboratory, Fort Myers, Florida; U. S. Public Health Service Pesticides Laboratory, Richmond, Florida; Field Maintenance and Warehouse Facility and Aircraft Maintenance Hangar Modification, Homestead Air Force Base; Air Conditioning Maintenance Hangars and Supply Warehouse for Chrysler Corporation, Airtemp Division, Pan American Airways, Miami International Airport; Mount Sinai Hospital Addition consisting of steam power plant modification, utility systems, kitchen modernization and building additions; Holsum Baking Plant and related facilities; Housing projects at Howard Air Force Base, Panama, Canal Zone and Ramey Air Force Base, Puerto Rico; and numerous high rise office, apartment and hotel buildings.

1962 to 1963 - H. J. Ross Associates, Consulting Engineers, Miami, Florida. Project Engineer in charge of plant and maintenance systems development of Manned Space Flight Center Capsule, Supply, Shipping and Receiving Building Merritt Island, Florida and as advisor for development of experimental jet engine test facilities for Pratt and Whitney Aircraft, Palm Beach, Florida.

1960 to 1962 - U. S. Air Force, Director of Material and Commander of Aircraft Maintenance Squadron for Troop Carrier Wing utilizing C-124 and C-119 type aircraft in world wide operations.

1958 to 1960 - Charles Payne and Associates, Consulting Engineers, Miami, Florida. Chief Mechanical Engineer of the Firm in charge of design for building systems, utility systems, industrial processes and for Research and Development for the U. S. Government and private industry. Representative projects were the concept development of a mechanically retractable and air transportable shelter for the Jupiter missile system and the subsequent design of the structure and its mechanical and electrical components; the Federal Office Building, Miami, Florida, a high-rise office building; high-rise apartment, hotels and office buildings; military facilities at Homestead Air Force Base, Patrick Air Force Base, Key West Naval Air Station and Miami International Airport consisting of aircraft maintenance facilities, dormitories, service clubs, office buildings and utility systems.

1955 to 1958 - U. S. Navy, Bureau of Aeronautics. Chief Mechanical Engineer in charge of the Design Division of the Public Works Department at the Marine Corps Air Station, Miami, Florida. Responsible for all phases of Mechanical Engineering associated with the development of new devices and systems such as portable and mobile aircraft ground support equipment, ditching simulators and aircraft arresting gear; the design of high pressure helium storage and transfer facilities; aircraft fuel distribution and storage; ventilation, refrigeration and air conditioning and numerous other mechanical facilities.

1953 to 1955 - Owned and managed general construction contracting firm. Primarily engaged in construction of commercial and industrial facilities and structures. Pursued undergraduate study and received Bachelor of Science Degree at the University of Miami, Coral Gables, Florida.

1951 to 1953 - United States Air Force, Staff Facilities Engineer, rank of Captain, at military bases at Miami International Airport and Memphis, Tennessee. Responsible for support facilities for Troop Carrier Wing utilizing C-119 type aircraft including maintenance facilities, planning, design and construction.

1946 to 1951 - Owned and managed a general construction contracting firm engaged in the construction of all types of buildings and facilities.

1944 to 1946 - U. S. Air Force. Staff Engineer officer of flight test, research and development unit engaged in the development of aerial bomb ballistics, bombsight integrating mechanisms, and aircraft anti-pilot mechanisms. Devised and developed modifications to the Norden Bombsight which measured and compensated for extreme ground speeds of aircraft when encountering high altitude jet air streams. Developed ballistics for atomic bombs which were subsequently dropped in Hiroshima and Nagasaki, Japan. Was honored in being selected to deliver the third bomb to Japan, which of course was never dropped.

1940 to 1944 - U. S. Air Force. Instructed students at several advanced service schools in the theoretical and technical aspects of aerial bombs, bombardment procedures, bombsight integrating and stabilization mechanisms and aircraft auto-pilot and guidance systems as both aerial and ground instructor.

Prior to 1940 - Pursued course of study in Aeronautical Engineering. Worked for heavy construction company as dragline operator and machinery mechanic.

BIOGRAPHICAL SKETCH

J. WALTER BECK, Ph.D.

Personal Data

Born: September 4, 1913, Doylestown, Pennsylvania
Married: .One Child.
B.S. - 1936 - Pennsylvania State College (School of Chem. & Physics).
State College, Pennsylvania.
M.S. - 1948 - Biology (Parasitology), Emory U., Emory U., Georgia
Ph.D.- 1950 - Biology (Parasitology), under Dr. Asa C. Chandler,
Rice Institute, Houston, Texas.
1950-51 - One year post doctoral studies at "El Instituto de Salubridad
Y Enfermedades Tropicales", Mexico City, Mexico.
Research and Investigation in the Treatment of Helminth
Infections with Dr. Luis Mazzotti, Chief of Helminthology
Department.
1951-52 - Assistant Professor, Dept. of Bacteriology & Parasitology.
U. Of Arkansas School of Medicine, Little Rock, Arkansas.
1952-53 - In charge of Helminthology Unit, (Parasitology, Mycology
Section), Communicable Disease Center, U.S.P.H.S., Chamblee,
Georgia. (Visiting Prof. in Parasitology, Emory U. School
of Med.)
1953-57 - Assistant Professor, Dept. of Bacteriology, U. of Miami
School of Medicine, Coral Gables, Florida.
1957-62 - Associate Professor, Dept. of Microbiology.
1962-64 - Associate Professor, Dept. of Preventive Medicine and
Public Health.
1964- Associate Professor, Department of Pathology
1959- 62 - Accompanied 6 Senior medical students each year on a 1
month study of Tropical Diseases in Central America.
1963 - Accompanied Senior medical students on a 3 months
study of Tropical Diseases in South America.
1964 - - Summer in Tropics with Medical Students
1967 - Chairman, Department Allied Health Technologies
Miami-Dade Junior College
1967 - Associate Professor (part-time)
Department of Pathology
University of Miami School of Medicine

910

BIOGRAPHICAL SKETCH

J. Walter Beck, Ph.D.

Societies

Royal Society of Tropical Medicine & Hygiene
American Society of Tropical Medicine & Hygiene
American Society of Parasitologists
Sigma Xi
American Institute of Biological Sciences
World Association for the Advancement of Veterinary Parasitology
Association for Tropical Biology
International College of Tropical Medicine
Diplomate of the American Board of Microbiology

Consultant

Veterans Administration Hospital, Coral Gables, Florida
Book Reviews for J.A.M.A. and other Journals
Abstracts for Excerpta Medica
Mt. Sinai Hospital
Jackson Memorial Hospital
Member, Dade County Pollution Hearing Board

BOOK REVIEWS
By
J. WALTER BECK, Ph.D.

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J. Walter Beck, Ph.D.

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RESUME'

NAME: Carlton L. Nelson Age: 55
530 Sabal Palm Drive
Key Biscayne, Fla.

Property Owner in Dade County since 1954.
Resident of Dade County since 1952.

EDUCATION:
Primary schools in Michigan and Wisconsin.
B. S. degree (Civil Engr.) University of Michigan.
M. S. degree in Civil Engr. (Sanitary) Univ. of Mich.

EXPERIENCE:

1938-39-40	Stream Pollution Control Engr., State of Illinois.
1941-1945	Reserve Officer on active duty Combat Engineers. Lt., Capt., Major, Lt. Colonel.
1946-1950	Principal in Baxter Nelson and Woodman, Consulting Sanitary Engineers, Chicago area.
1951-1952	Structural and Sanitary Engineer Pure Oil Co., Chicago.
1953 to present:	Principal in a construction company. Professional Engineer, commerical and industrial building design.

CURRENT PROFESSIONAL STATUS:
- a. Registered Professional Engineer:
    - 1. State of Florida #4820
    - 2. State of Michigan #5497
- b. Registered Structural Engineer
    - 1. State of Illinois #1857

FAMILY:
Wife
Two sons

CHURCH AFFILIATION:
Key Biscayne Community Church.

Name: Bernadette Bocklage Bourne, PhD.

S. E. Missouri State College, B. S., 1946
St. Louis University, Ph.D., 1952.

Instructor in Biochemistry, St. Louis University, 1952-6
Assistant Professor in Biochemistry, St. Louis University, 1956-9
Director of Clinical Chemistry Laboratory, City Hospital, St. Louis, Mo. 1957-9
Assistant Professor in Neurology and Biochemistry, University of Miami 1959-1967
Director of Clinical Chemistry Laboratory, Morton F. Plant Hospital, Clearwater, Florida 1967-1968
Director of Clinical Chemistry Laboratory, Mercy Hospital, Miami, Florida Nov., 1968-present

Memberships:
- American Chemical Society
- Division of Biological Chemistry, ACS
- Sigma Xi
- American Association for the Advancement of Science
- American Association of Clinical Chemists
- Florida Section, AACC
- Fellow, American Association of Clinical Chemists
- Certified Clinical Chemist, American Board of Clin. Chem.
- National Registery of Clinical Chemists.
- Fellow, American Institute of Chemists
- Member, Dade County Pollution Control Hearing Board, 1969- present

Offices Held:
- One of the organizers and charter members of the Florida Section,AACC
- Past Secy, Fla. Section, AACC
- Past Pres., Fla. Section, AACC
- Past Chairman of Membership Committee, Fla. Section, AACC
- Program Chairman, 18th National Annual Meeting, AACC and Co-general chairman (Miami Beach, Aug. 1966)
- Alternate Executive Committteeman of AACC from the Fla. Section 1962-4
- Executive Committeeman, 1965-1966

Research Support:
- Biochemistry Dept. supported research (St. Louis Univ., 1952-9)
- Institutional Grants (Univ. of Miami)

October 9, 1962	$2,000
August, 1965	1,197

NIH Grant, Principal Investigator

Sept. 1, 1966	$27,537.00 (First Year)
	14, 670.00(Second Year

Investigator on Dr. Scheinberg's Cerebral Blood Flow grants, 1959-1967

Experience: (Summary)
Fifteen years in research and teaching at two universities.
Seven years in Clinical Chemistry laboratories at 4 different hospitals.

Publications:

See addended sheets.

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AND DEAN, SCHOOL OF MEDICINE
P. O. BOX 875, BISCAYNE ANNEX

Location:
SEWELL BUILDING
1475 N. W. 12th AVENUE

April 13, 1967

Dr. Bernadette B. Bourne
Department of Neurology
University of Miami School of Medicine
Miami, Florida

Dear Dr. Bourne:

I have just seen your letter of April 11 to Dr. Scheinberg relating to your plans to move to Clearwater. I should like to tell you how sorry I am to see you leave the University of Miami and to thank you for the splendid service you have given us during the last eight years. We will all miss you. I am glad that you are going no farther away than Clearwater and hope you will come back and see us occasionally.

Sincerely,

Hayden C. Nicholson, M.D.

HCN:gf
cc: Dr. Edward L. Chambers
Dr. L. S. Dietrich
Dr. George T. Lewis
Dr. Peritz Scheinberg
Dr. George Tershakovec

UNIVERSITY OF MIAMI
MIAMI, FLORIDA 33136

April 11, 1967

DEPARTMENT OF NEUROLOGY
1601 N. W. 11th Avenue

Dr. Peritz Scheinberg,
Chairman, Department of Neurology
University of Miami
School of Medicine
Miami, Florida

Dear Dr. Scheinberg:

This letter is in reference to our recent conversation (Monday, April 10th) in which I told you of the pending move of the Bourne family to Clearwater, Florida, necessitating my resignation from the University of Miami School of Medicine.

I would like to tender my resignation, to be effective May 31, 1967, with terminal vacation the month of May. I plan to fulfill my committment to the Biochemistry Department to give 4 lectures to the Freshman class the first week of May, and to oversee the final experiments to finish up the research project by approximately the middle of May.

I wish to take this opportunity to express my appreciation to you and other faculty of the University and to the administrative staff with whom I have enjoyed pleasant and stimulating professional contacts throughout the past eight years.

Very truly yours,

Bernadette B. Bourne

Bernadette B. Bourne, Ph.D., Assist. Prof.
Neurology and Biochemistry

cc: Dean Nicholson
Dr. George T. Lewis, Assoc. Dean
Dr. T. Chambers
Dr. L. S. Dietrich
Dr. George Tershakovec

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